AUGUST
1958

FOUNDRY

A PENTON PUBLICATION

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- Wear Resistance of Gray Iron—Page 62

Doing It Better in A New Foundry

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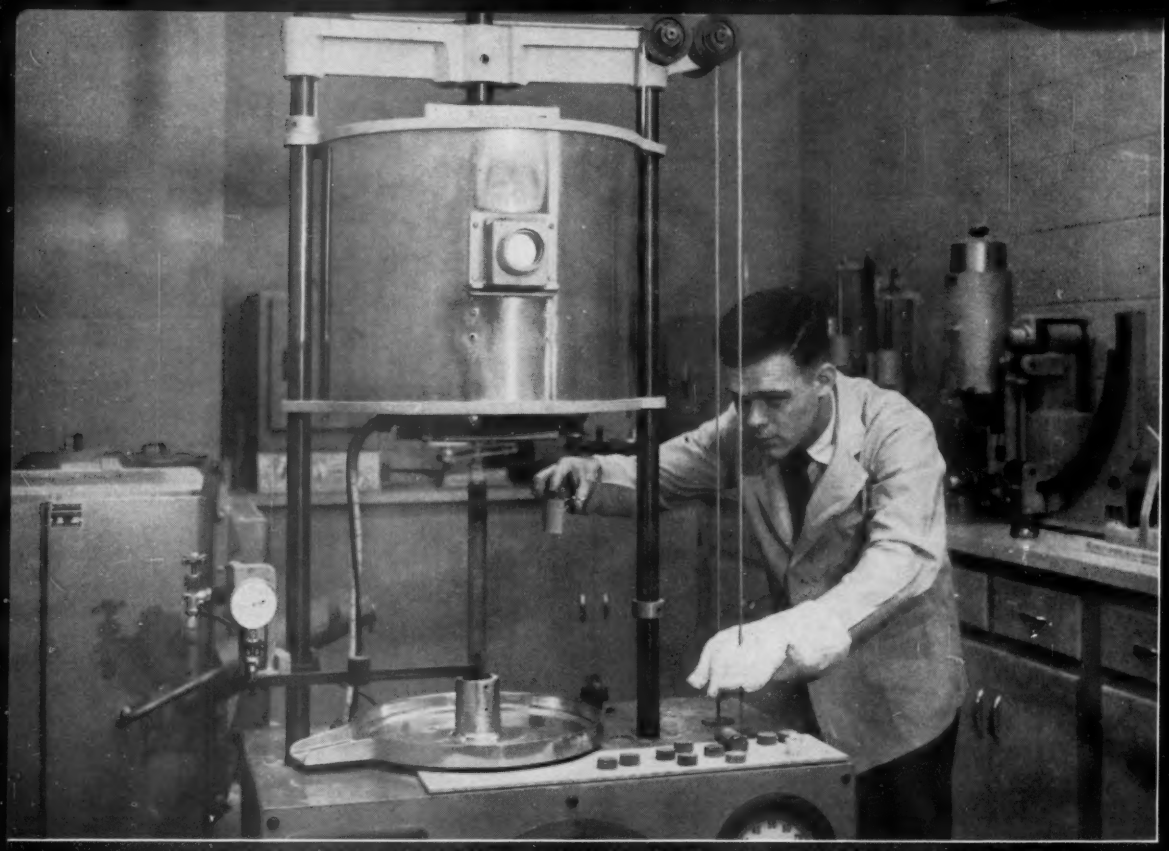


At Magcobar's Des Plaines, Illinois, laboratory, A. H. Zrimsek uses modern methods for foundry sand research.

SCIENCE and SAND

. . . Recipe For Progress

In new laboratories at Des Plaines, Houston and Greybull Magcobar technicians are busy with silica, bentonite, water and a host of other ingredients, taking the guesswork out of sand formulas. Applying modern research methods, these scientists are *proving* the "hows" and "whys" of foundry sand practice.

Magcobar invites the technical and research groups of the American Foundries to use Magcobar facilities for the solution of various industry-wide problems relating to sands.

Write Des Plaines for our latest foundry technical bulletins. Look to Magcobar, producers of YELLOWSTONE bentonite, for further revealing recipes for progress.

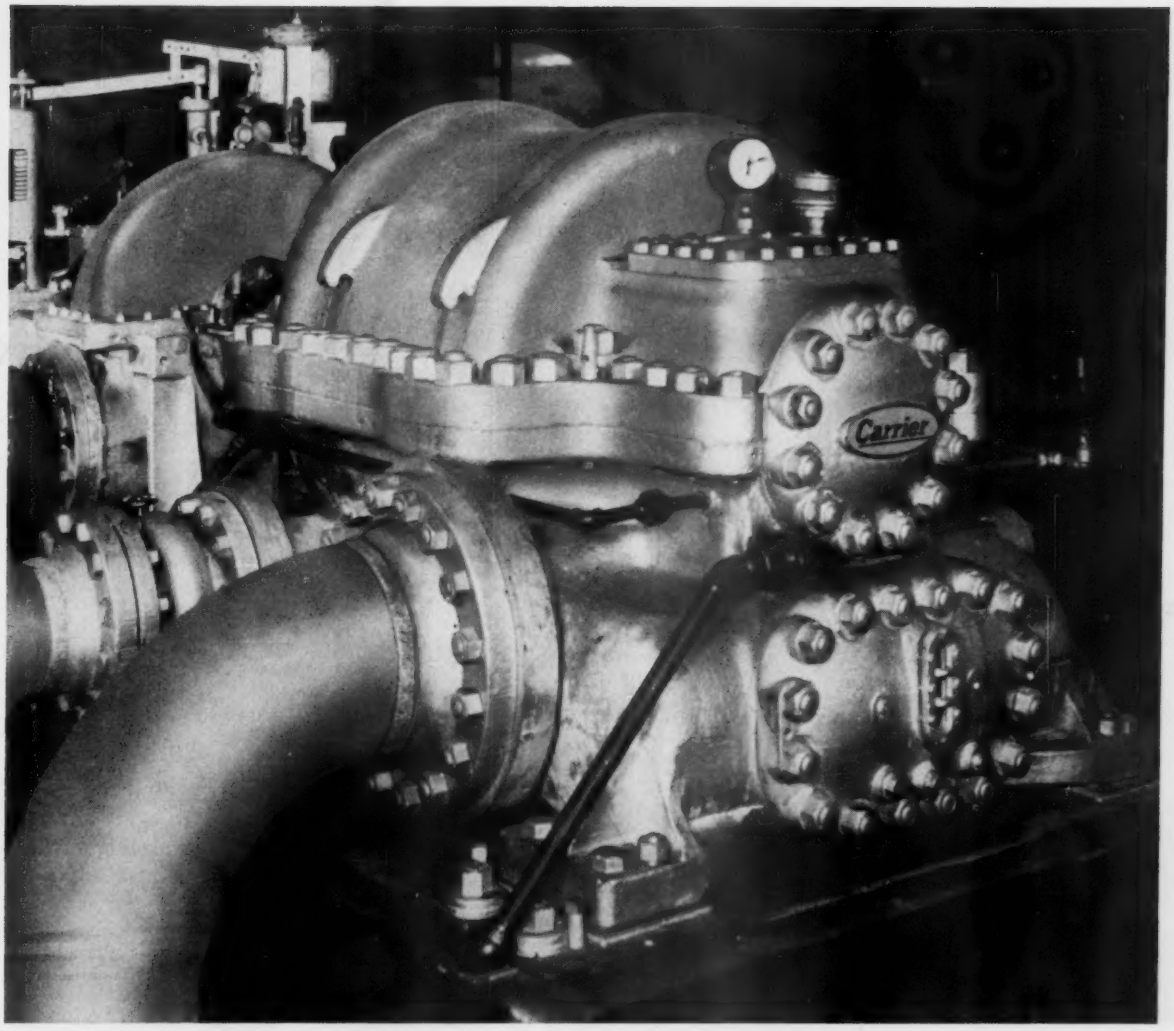
Magcobar technicians in the company's big research laboratories in Houston strive for constant improvement of Magcobar products.

This Magcobar plant at Greybull, Wyoming, where YELLOWSTONE is mined and processed, is the world's largest producer of bentonite, and includes a complete quality-control laboratory.

Magcobar
YELLOWSTONE
BENTONITE

MAGNET COVE BARIUM CORPORATION

Des Plaines, Illinois, 576 Northwest Highway
Houston, Texas, P. O. Box 6504
Greybull, Wyoming



4½% Nickel plus good casting makes these casings strong and tough at–185°F

Here's how the foundry solved a low temperature problem:

This Carrier #350 Compressor is designed for producing ethylene by low temperature (–185°F) high pressure (600 psi) fractionation.

Under these conditions ordinary cast steel is brittle and could easily fracture. Could the foundry turn out castings which would have high strength and toughness at the low temperatures involved?

They could . . . this way:

They made these three-ton compressor housing castings from 4½% nickel alloy steel; normalized and water quenched them, and finally tempered them. Under this treatment the castings easily exceed these minimum mechanical properties:

Ultimate tensile strength	70,000 psi
Yield strength	40,000 psi
Elongation in 2"	22%
Reduction of area	30%
Charpy keyhole impact (@ –185°F)	15 ft. lb.

Nickel does wonders for cast irons and steels destined for severe service . . . aids development of desired metal structure.

Recommend Nickel Alloys Freely

Nickel is a plentiful and versatile material and you can count on Inco Nickel's Development and Research Division for information to help you in selecting specific materials to use in particular applications.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

"No machining complaints since I used SMZ alloy"

You can eliminate chilled corners and hard spots in gray iron castings with ladle additions of "SMZ" alloy. Machining rates can thus be improved by as much as 25 per cent, giving you more satisfied customers.

"SMZ" alloy is the most widely used inoculant in the iron foundry industry. As little as 2 to 4 pounds of "SMZ" alloy per ton of iron are sufficient to eliminate chill in light castings. For harder irons of lower carbon and silicon contents, a larger addition of the alloy may be required.

For information on how "SMZ" alloy can improve the machinability of your castings, contact your ELECTROMET representative. Ask for the booklet, "SMZ Alloy—An Inoculant for Cast Iron."

ELECTRO METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

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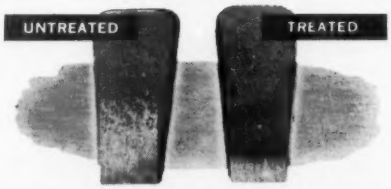

These chill blocks show how "SMZ" alloy reduced chill in a 3.15% carbon, 1.80% silicon iron.

Electromet
FERRO-ALLOYS AND METALS

UNION CARBIDE

The terms "Electromet," "SMZ," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

FOUNDRY

A PENTON PUBLICATION

August 1958

Volume 86 — Number 8

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EDITORIAL STAFF

FRANK G. STEINEBACH
Editor

WILLIAM G. GUDE
Managing Editor

EDWIN BREMER
Metallurgical Editor

ROBERT H. HERRMANN
Associate Editor

JACK C. MISKE
Associate Editor

VIRGINIA C. TAYLOR
Assistant Editor

VIRGINIA B. HARMS
Assistant Editor

DON S. CADOT
Art Editor

MAIN OFFICE

Penton Building
Cleveland 13, Ohio
Main 1-8260

Branch Offices: New York, Detroit, Chicago, Pittsburgh, Washington, and London

(For addresses of branch offices, see Page 201)

FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions.

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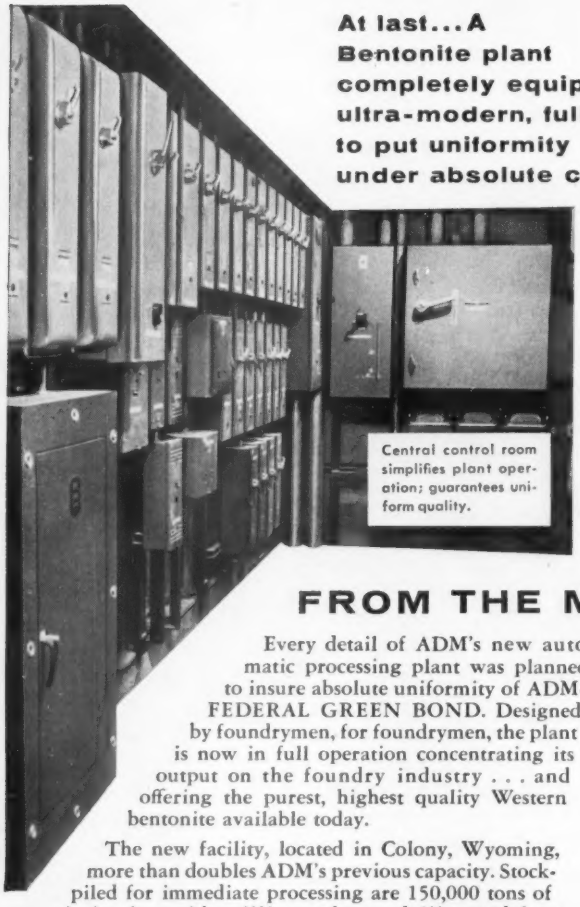
At last... A Bentonite plant completely equipped, ultra-modern, fully automatic to put uniformity under absolute control with...

"AUTOMATED" PROCESSING



Central control room simplifies plant operation; guarantees uniform quality.

FROM THE MINE TO YOUR PLANT

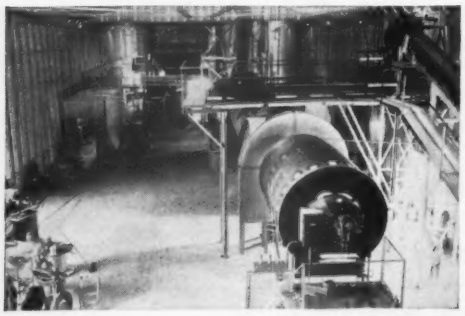
Every detail of ADM's new automatic processing plant was planned to insure absolute uniformity of ADM-FEDERAL GREEN BOND. Designed by foundrymen, for foundrymen, the plant is now in full operation concentrating its output on the foundry industry . . . and offering the purest, highest quality Western bentonite available today.

The new facility, located in Colony, Wyoming, more than doubles ADM's previous capacity. Stockpiled for immediate processing are 150,000 tons of virgin clay, with millions of tons drill-tested for purity and ready for mining.

Every chance of human error has been eliminated by the latest production control devices. All measuring and weighing is done by instruments, dryer heat is electronically controlled, material is handled by the most modern pneumatic and belt conveyors, and packaging is completely automatic.

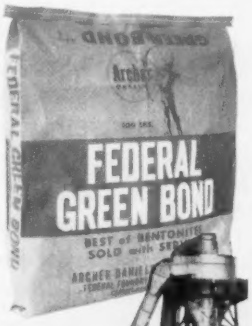
These are a few reasons why ADM-FEDERAL GREEN BOND Bentonite will provide more casting benefits per dollar than any binder of its kind.

The Colony operation is further evidence of ADM's determination to provide the foundry industry with intelligent solutions to their casting problems. Talk to an ADM field service representative today and you'll see these attitudes reflected. Why not visit our new plant soon?



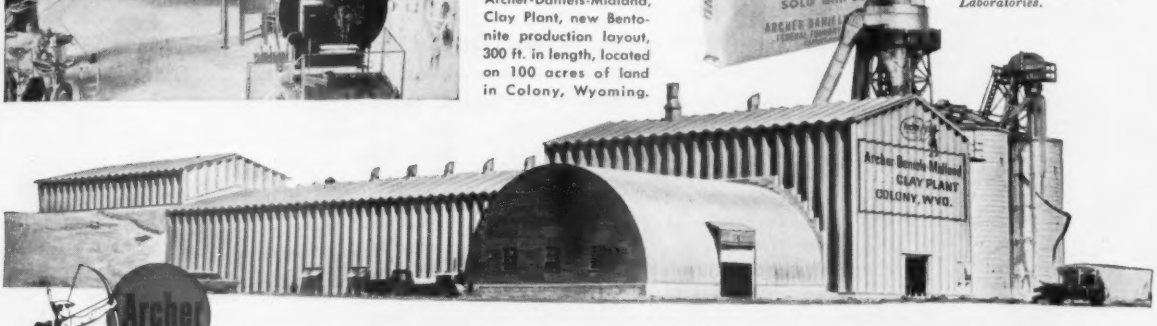
Interior of processing plant illustrates in-line arrangement of equipment. Dryer is shown in foreground.

Archer-Daniels-Midland, Clay Plant, new Bentonite production layout, 300 ft. in length, located on 100 acres of land in Colony, Wyoming.



The new bag design for ADM-FEDERAL GREEN BOND Bentonite is now labeled with the familiar Archer trademark, your guarantee of quality.*

**Two first-place awards in the American Oil Chemists Society's Smalley Check Sample Competition have been won by ADM Control Laboratories.*



Archer Daniels Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street • Cleveland 2, Ohio

Circle 555 on Page 103

ADCOSIL

BEST FOR CO_2 CORES...

An exclusive feature in ADCOSIL is a color indicator that tells when to stop gassing a CO_2 core. The core mix is tinted a royal purple . . . then fades to a natural sand color when the core is cured throughout.

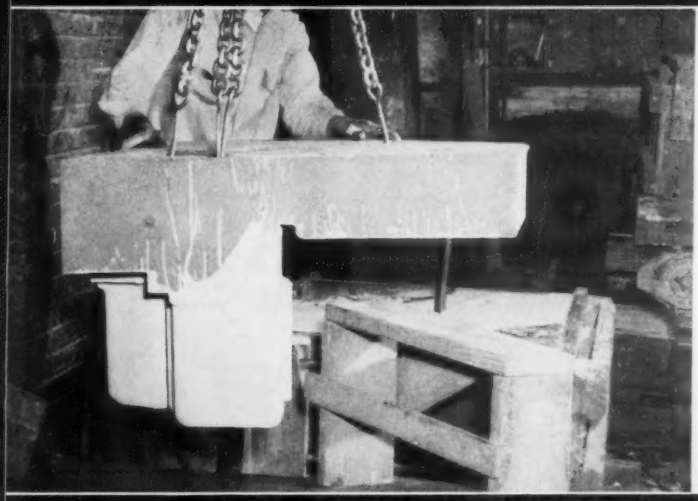
ADCOSIL helps determine where to place core vents and how many to use; helps rig new boxes and patterns; prevents under-gassing, over-gassing; encourages cores designed for most efficient flow of gas; cuts time and costs; saves gas.

Flowability, workability, core hardness, and long bench life are inherent in ADCOSIL sand mixtures.

Several types are available:

For ferrous metals . . . . . ADCOSIL F
For non-ferrous metals . . . . . ADCOSIL NF
For super-collapsibility, all metals. ADCOSIL SC

ARCHER • DANIELS • MIDLAND COMPANY



LIN-O-SET

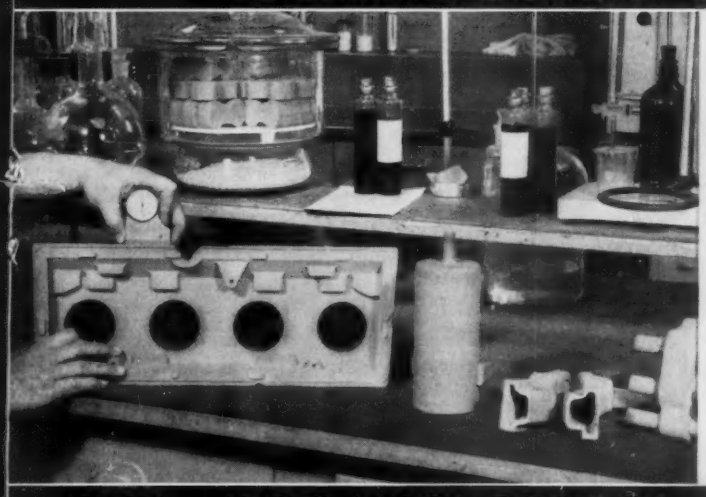
BEST FOR AIR SET CORES...

LIN-O-SET II, the phenomenal air-setting binder developed by ADM research, has been widely accepted coast-to-coast by large jobbing foundries searching for maximum efficiency.

LIN-O-SET II works in room temperature at exceptional speed hardening the "core of the core" almost as fast as the exposed surfaces. An ADM "first", this development takes the guesswork out of drawing, since the curing of a LIN-O-SET II core combines internal polymerization with surface oxidation.

All this . . . plus the better-known LIN-O-SET features; minimum ramming; saving in cleaning time; thorough collapsibility; elimination of excessive rodding; control of set-up time; improved accuracy; elimination of objectionable odors and toxic gases.

FEDERAL FOUNDRY SUPPLY DIVISION



ADMIREZ

BEST FOR SHELL-MOLDS AND SHELL-CORES...

Through ADM research, ADMIREZ LC-109 and CC-250 are now offered as general-purpose cold coating resins for both shell cores and molds. ADMIREZ LC-109, a liquid resin, has proven to have outstanding coating characteristics providing special sand properties which result in freedom from warpage and distortion in large, intricate cores. LC-109 offers better shake-out and collapsibility, particularly in low-temperature alloys. The advantages of ADMIREZ CC-250, a powdered phenolic resin, are: fast coating; quick breakdown during mulling; high flowability of coated sand; exceptionally fast cure time; excellent stripping from pattern; high tensile strength and lack of brittleness; low-shell breakage; lack of thermal plasticity.

2191 WEST 110TH STREET • CLEVELAND 2, OHIO

ARCHER QUALITY

Now included in the Archer Quality Line

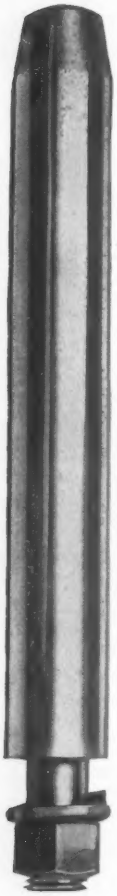
FEDERAL GREEN BOND BENTONITE . . . FEDERAL SAND STABILIZER
CROWN HILL SEA COAL . . . and a COMPLETE LINE of FOUNDRY FACINGS

ARCHER-DANIELS-MIDLAND
Federal Foundry Supply Div.
2191 West 110th Street
Cleveland 2, Ohio

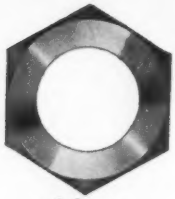
Gentlemen, I am interested in trying:

- ☐ ADMIREZ LC-109
- ☐ ADMIREZ CC-250
- ☐ LIN-O-SET II
- ☐ ADCOSIL F
- ☐ ADCOSIL NF
- ☐ ADCOSIL SC

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

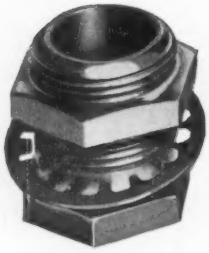


Adams Round Pin
Hardened, Ground,
Hard Chrome Plated

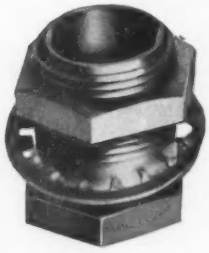


Adams
Round Bushing
(End View)
Open

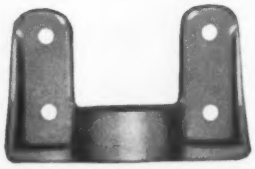
Adams
Elongated Bushing
(End View)
Hexagon Pin Inserted

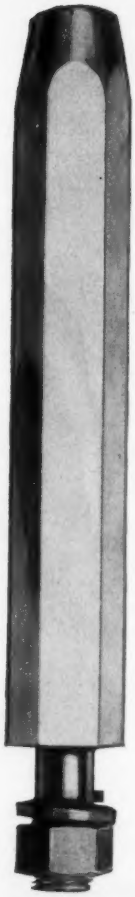


Adams
Round Bushing
Nut and Lock Washer
Long Flask
Short Plate



Adams
Elongated Bushing
Nut and Lock Washer
Long Flask
Short Plate





Adams Hexagon Pin
Hardened, Ground,
Hard Chrome Plated

Adams Pins and Bushings for Cherry and Aluminum Flasks assure you top quality and precision for close tolerance operation.

Proper mountings for pins and bushings for all Cherry Flasks are offered to meet practically all of your requirements.

Adams Pin and Bushing Mountings
(Cast Aluminum)
For Cherry Flasks
For Small Flasks—(Standard)

For New Equipment or as Part Replacement, the same care and accuracy in manufacture helps make the toughest jobs productive.

A wide variety of pin arrangements is included to complete our line. Write us at once for full information.

LET ADAMS HELP YOU ANALYZE YOUR FLASK EQUIPMENT PROBLEMS

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

Circle 556 on Page 103

B.F.Goodrich

This B.F.Goodrich belt lasts 8 times longer, cuts costs $3,500

B. F. Goodrich improvements in rubber brought extra savings

Problem: The sand on that conveyor belt is hot enough to bake bread—375 degrees according to the thermometer in the man's hand. It's shaken from red hot castings, dumped on the belt and carried away to be reused. But the scorching hot sand baked belts hard, made them crack and break. Belts needed constant repairs, had to be replaced every three months.

What was done: When a B.F.Goodrich salesman heard of the problem, he suggested a new belt called Solarflex, specially designed by B.F.Goodrich to handle hot materials. This belt is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden, crack, and finally break down. Instead of ordinary fabric, B.F.Goodrich used *glass* fabric (optional) to make a belt that can stand extreme temperatures.

Savings: The B.F.Goodrich Solarflex belt has now given 2 years of trouble-free service—8 times that of previous belts—and still shows no sign of wear. The foundry's maintenance supervisor estimates it has already saved $3,500 in replacement belts alone, and he expects at least two more years' use from the B.F.Goodrich Solarflex belt.

Where to buy: Your B.F.Goodrich distributor has the exact specifications on the belt that solved the problem in this foundry. And as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Department M-389, Akron 18, Ohio.*

B.F.Goodrich *industrial products*

Circle 557 on Page 103

For the finest in Mechanization

Jeffrey's **UNIVERSAL MOLD CONVEYOR** is Flexible

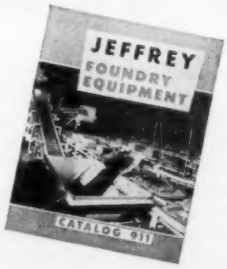
Molds move on the level, up, down and around on the Jeffrey Universal Mold Conveyor . . . full operations at elevations to best suit each job. It's working in many foundries around the country, helping to boost their earnings.

Operation is smooth; power consumption is low; equipped with sealed-for-life ball bearings and oil-impregnated bushings; internal takeup on each car.

All moving parts are shielded, giving full protection against sand, shot and runout. Rugged construction gives strength to spare for the toughest jobs.

MORE FACTS:

Catalog 911 tells about this and other Jeffrey foundry equipment. For a copy, write The Jeffrey Manufacturing Company, 907 N. Fourth Street, Columbus 16, Ohio.



MECHANIZE with Jeffrey machinery and save. Your materials-handling and power transmission equipment will give more efficient, economical operation if you employ time-tested, dependable Jeffrey products.

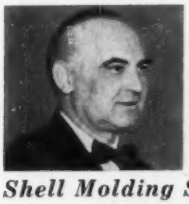
JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT... TRANSMISSION MACHINERY... CONTRACT MANUFACTURING

Circle 558 on Page 103

This 23-lb. motor frame illustrates the smoothness of castings made in G-E shell molds. It is unusual too as one of the heaviest castings in regular production by the shell molding process.

"smooth castings are more salable



...and we get consistent smoothness with G-E Shell Molding Resins," says James J. Silk, Shell Molding Sup't, Taylor & Co. Inc., Brooklyn, N.Y.

When parts must be cast to close tolerances, the foundry that uses shell molding holds a big competitive advantage.

Shell molding provides a degree of surface finish that reduces machining up to 90% — in some cases, eliminates it entirely. The little machining that may be required is easier to do on a shell molded casting, too; absence of water in the mold prevents the surface hardening or "skin effect" imparted by conventional sand molds.

Aggressive foundries like Taylor & Co. promote these advantages to increase their sales of profitable precision-cast items. And, to insure the highest degree of accuracy in the shell mold itself, knowledgeable foundry superintendents like Taylor's Jim Silk rely on G-E Shell Molding Resins.

For technical data on G-E Shell Molding Resins and Silicone Release Agents, or for answers to your shell molding problems, write General Electric Company, Chemical Materials Dep't, Section F-38, Pittsfield, Mass.

Phenolics-first of the modern plastics...first in value

GENERAL ELECTRIC

Circle 559 on Page 103

All day, all night lifting sand

Imperial Belt works round the clock moving 400° foundry sand

This Imperial* Sahara* Belt stays scorching hot almost all the time. Operating 24 hours a day at a speed of 258 feet per minute it lifts 400° F. sand in the foundry of Pratt & Letchworth Division of the Dayton Malleable Iron Co., Inc., Buffalo, N. Y.

The belt (90′ of 18″ x 8 ply Standard Sahara Impregnation 935) has been in use more than a year . . . an unusual record under such heat.

Like all Imperial Belts, it is job-designed for specific operating conditions. Special Impregnating compounds toughen every fiber of the heavy-duty duck base fabric and insulate it from heat damage. INNER-LOCKED* stitching permanently prevents ply separation, makes Imperial belts ideal for bucket elevator use.

Imperial Sahara Belting outwears any other belting made for foundry service...gives you lowest ultimate cost.

*Reg. Trademark of Imperial Belting Co.

Imperial

BELTING COMPANY

1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

Mail this coupon today for NEW Belting Catalog and Engineering Handbook

Name_____

Address_____

Circle 560 on Page 103

With the Editors

COVER: Growing use of control equipment in the modern foundry is typified by the illustration on this month's cover. It shows Carl Schopp, left, assistant general superintendent, and David Morgan, labor foreman, in the melting control room of Link-Belt Co.'s new Indianapolis foundry. The panel shown includes controls for weight, temperature, and humidity of the cupola blast, controls for pulverizing coal to fire air furnaces, and controls for a waste heat boiler which utilizes hot gases from air furnace stacks to generate steam for plant heating and processing. A detailed description of the new foundry starts on Page 40.

—o—

He Earned Them: Once more, Bill Walkins, editor of *The Esco Ladle*, published by the Electric Steel Foundry Co., Portland, is receiving congratulations. For the third consecutive year, that publication has won the National Advertising Agency Network's premier award for internal house organs of magazine format. The award was captured in a field of 300 entries.

Bill, may I add my word of praise to the many others. Not only are you an outstanding editor, an excellent poet, a good photographer, and a fine foundryman, but you are also one of the nicest fellows it has ever been my pleasure to meet. Keep up the good job, and they'll have to give you more of those awards.

—o—

Gives Success Story: George W. Cannon, former president and one of the founders of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., was the principal speaker at Michigan Tech's annual public honors convocation on May 27. A story in the *Daily Mining Gazette*, Houghton, Mich., May 22, calls George the "Henry Ford" of the foundry industry and tells how in 1908 the three partners pooled their savings of $1000 each and purchased a small foundry in Michigan. By 1910 the volume of business had so increased that another new plant was acquired.

The importance of CWC as a supplier of castings during the war was emphasized by Dr. Roy W. Drier of the Michigan Tech faculty, who was a naval liaison officer at that foundry during the war.

—o—

Always Ready: Last April I was privileged to attend a seminar staged at the United States Naval Academy, Annapolis, Md., by the Department of the Navy for publishers of National Business Publications. It was an interesting and revealing experience.

From top men in the department, we learned of the part the Navy plays in our national defense and what its role is in support of national policy. We were told of the various tasks which face our Navy and the methods, means, and equipment for accomplishing them. This includes a wide range of capability, from mere stabilizing "pressure" to

Two Men Make 7-Million Cores a Year with Cities Service Core Oil!

Impossible? Not for the two core makers at Indiana Brass Company! Here's the story:

Recently, this firm, famous for its brass plumbing fixtures and fittings, determined to increase core production to meet rising product demand. First step was the installation of core blowers enabling sand to be blown directly into core boxes made to produce several cores at a time. Next, Indiana decided the cores should be baked in these same boxes.

Normally, this would require boxes with vents in the sides—an impossibility when you're blowing sand into them. But Indiana thought they could bake without vents, providing they could find the right core oil.

So, for six weeks, Indiana Brass tested one core oil after another. Only one proved successful... Cities Service Delco 64 ! Nowadays, with Cities Service Delco 64, Indiana uses its core blowers, then bakes directly in the core boxes, without air vents and without problems. Moreover, they've found Cities Service Delco 64 permits extremely fast baking. Thus, core boxes can rapidly be returned for use again and less boxes are needed.

If you want an oil to speed, simplify and reduce the cost of core production, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Co., 20 N. Wacker Drive, Chicago 6, Illinois.

READY ... SET ... POUR! In one week, Indiana Brass recently produced 121,147 castings! "Much credit goes to Cities Service Delco Core Oil," says Indiana. "It enables us to bake cores right in their boxes!"

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

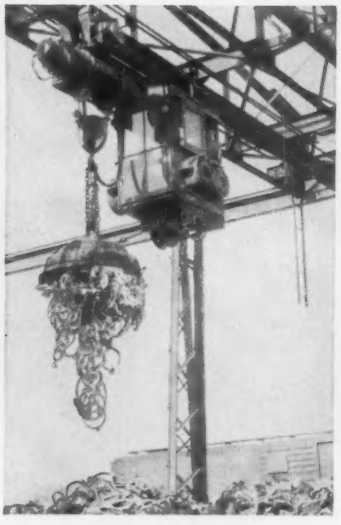
Circle 561 on Page 103

SHEPARD NILES
HOISTS

CUT HANDLING COSTS

in YOUR plant with the right hoist

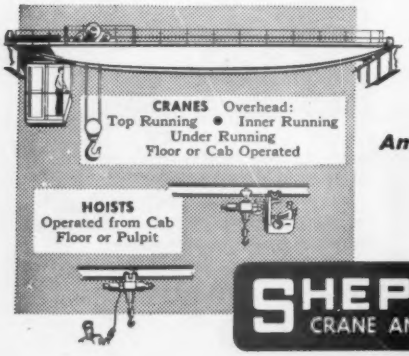
FLOOR-OPERATED HOIST
Operator primarily occupied with other duties, uses hoist for fast, efficient short hauls.



CAB-OPERATED HOIST
Cab operator moves loads at high speeds, can quickly spot material for handling.

WHICH Shepard Niles hoist fits your plant's needs . . . a floor-operated hoist where the operator is freed for other duties or a cab-operated hoist where the operator is engaged full time moving loads through the air? Shepard Niles manufactures both types in capacities from 1 to 20 tons.

Send for the descriptive bulletins on both Cab and Floor Operated Hoists . . . or ask that a Shepard Niles representative call — there's NO OBLIGATION.



Building
America's Most Complete Line of Cranes and Hoists Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION
1395 Schuyler Ave., Montour Falls, N. Y.

all out thermonuclear war. We were impressed with the fact that naval and marine forces provide a flexible and potent force able and ready to fight on the sea, under the sea, in the air, and on land. They have the means and ability to apply the calculated measure of force necessary to handle a general war, and at the same time be able to wipe out cities if that should become necessary.

I came away with a high respect for the work and potential of the Navy and Marine Corps.

The accompanying illustration shows the assistant secretary of Navy, a number of admirals, and the representatives of National Business Publications at the seminar.

—o—

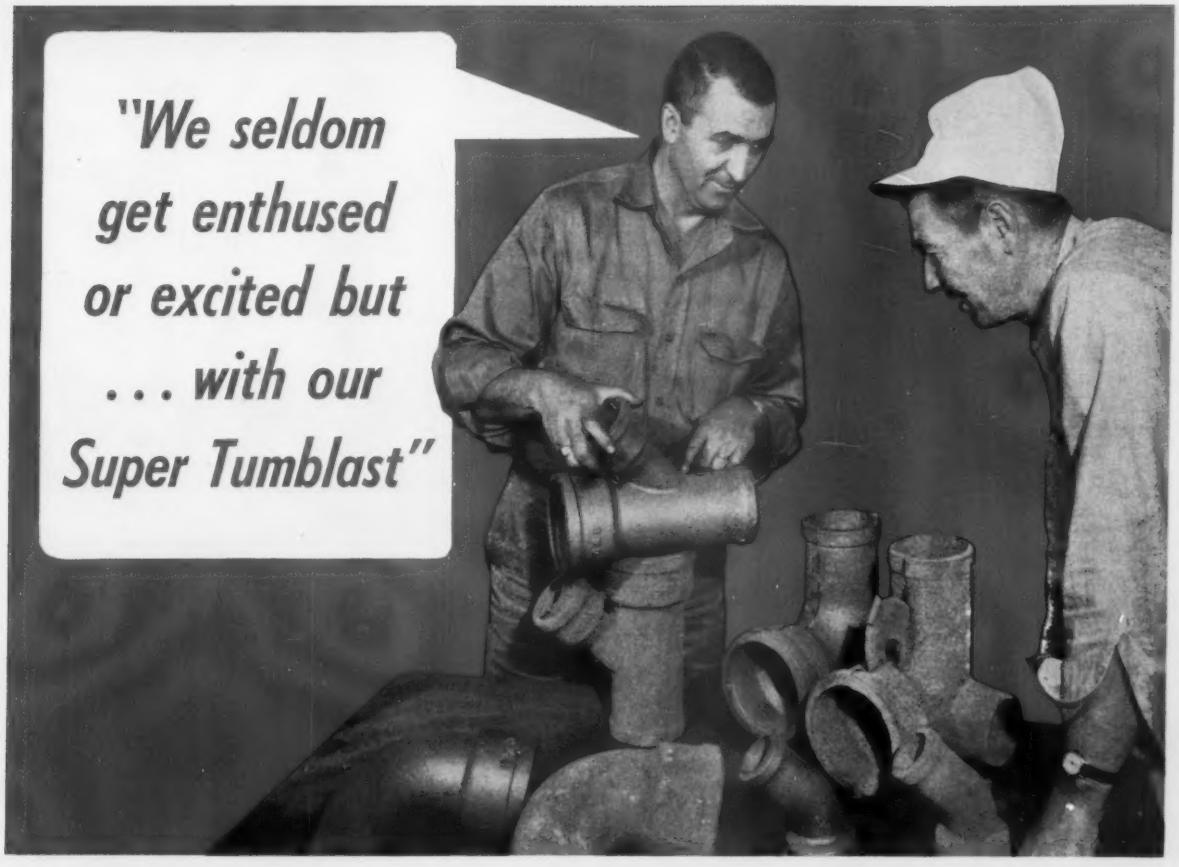
Still Going Strong: The annual Old Timers' Night of the Northeastern Ohio Chapter, AFS, hardly would be complete without Henry M. Oehling, veteran foundryman,

being present to greet old friends. Henry turned 86 years in July. In 1952 he retired from National Malleable & Steel Castings Co., Cleveland, after serving that organization for 65 years. In the accompanying illustration, Henry (second from the right) is being greeted by Walter L. Seelbach, president, Superior Foundry Inc., Cleveland (left); Frank J. Dost, president, Sterling Foundry Co., Wellington, Ohio, and Frank G. Steinebach, editor, FOUNDRY.

—o—

Obstinate Men: In the introduction of "Adventures of an Inquiring Mind," a 62-page booklet heralding the golden anniversary of General Motors Corp., President Harlow H. Curtice stated, "The price of progress is always trouble. But there were men who were obstinate, men who failed thousands of times to succeed once." What an apt description of some of the GM foundrymen of the past who contributed so much to the development of castings for the modern automobile, and who, it is to be regretted, were not mentioned in the booklet.

F.G.S.



Wahkonsa Foundry Co. Says:

"We have every right to get excited with our Wheelabrator Super Tumblast because we are now cleaning 2400 pounds of castings in the time it took to clean 1200 pounds before! In terms of man hours, we have reduced our cleaning time on pipe fittings 50%!

"Another thing that impresses us is that we are doing a much better job of cleaning than formerly so we are able to offer a much better quality product than we did in the past. The Wheelabrator Super Tumblast has enabled us to cut our cleaning time on both our pipe and fittings from a 24 hour per day job to a 16 hour per day job."

The way F. W. Dennis, manager of the Wahkonsa Foundry Company, Des Moines, Iowa, expressed enthusiasm for the performance of their Wheelabrator Super Tumblast is similar to many other testimonials received from foundries using this airless method of batch type blast cleaning. Wheelabrator Super Tumblast cuts costs in every foundry cleaning problem. To learn how you, too, can make super savings, write for Bulletin 145-D.

WHEELABRATOR

CORPORATION

505 South Byrkit Street, Mishawaka, Indiana

World's Largest Manufacturer of Airless Blast Cleaning Equipment

Circle 563 on Page 103

3 "Hot" Items in the

COMPLETE AO LINE

of Quality Protection for Foundrymen!

Protection from Metal Splashes

NEW Aluminized H-3 FACE SHIELD

Keeps workers cooler, efficient on hot operations where face protection is needed — operations such as furnace inspection become tolerable because window reflects 80% of radiant heat. Aluminizing eliminates costly window replacement due to heat crazing and warping — tests indicate over 4 times longer window life. Patented floating snap fasteners assure trouble-free window interchange. Deeper spark deflector increases protection. Real leather sweatband snaps in and out for fast and easy cleaning. Adjusts to any head size. Recommended for smelting, forging, metal pouring and furnace operations.

YOUR NEAREST AMERICAN OPTICAL SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU.

ASK HIM ALSO ABOUT THE COMPLETE AO LINE OF SAFETY CLOTHING AND RESPIRATORS.

NEW 315 FOUNDRY GOGGLE

Foundrymen like the greater impact protection from the larger mask . . . the better vision from 57.8 mm. wide vision lenses . . . the stepped up (double) ventilation from a 40 mesh screen. Fits over most spectacle glasses. Adjustable rubber headband "clips" through metal frame for close fit. Soft plastic mask standard. Available with leather also. Super Armorplate clear or Calobar lenses. NOTE: Goggle is also available with 150 mesh inner screen set behind a 16 mesh screen for dust protection — ask for No. 316.

S-7X211 SPAT with Rubber Flare

Gives positive (no-curl) protection against molten metal splash and up to 400% longer wear. 7½" flare fits snugly and can be trimmed to smaller foot. 2 leather bag straps on leg have slide fasteners for quick adjustment. Wide elastic webbing has 2 snap fasteners for quick release. Replaceable understrap is same material as flare. Uppers are chrome tanned cowhide.

Always insist on AO Trademarked Safety Products

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers Located in Principal Cities

1833-1958 • 125 LEADERSHIP YEARS

Pot room in modern aluminum smelter at Isle Maligne, Quebec.

To aluminum fabricators...

who want the advantages of primary production –without the overhead

Aluminum production is a complex business. To operate a smelter made up of dozens of "pot-lines" like the one above presents innumerable problems: raw material supply, vast quantities of electric power, trained personnel, careful quality supervision—the list is nearly endless. Yet this pot-line and dozens like it in Quebec and British Columbia are at your service through Aluminium Limited.

If you would like to learn how these modern aluminum plants can work for you, call your Aluminium Limited representative. His company sells no consumer products in the U.S. Instead, it specializes in bringing you the primary aluminum you need . . . produced in a wide variety of ingot forms and alloys . . . quality-controlled to assure you every manufacturing economy. In short, all the advantages of your "own" primary production—without the overhead. For information call or write the nearest office of Aluminium Limited Sales, Inc.

Aluminium Limited

*Ingot Specialist...*serving
American Aluminum Fabricators

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CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA

Additional distribution (Alcan Foundry Alloys):
Apex Smelting Company, Chicago, Cleveland, Los Angeles
Charles Batchelder & Company, Botsford, Conn.

Circle 565 on Page 103

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available only from Carver

BEST QUALITY Steinex gives you absolutely the best shakeout — BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

RUSH information and prices on Steinex binders.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

Calendar of MEETINGS

Sept. 10-11—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 15-19—Instrument Society of America, annual Instrument - Automation Conference and Exhibit, Convention Hall, Philadelphia.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 22-24—Material Handling Institute Inc., joint industry fall meeting, Greenbrier, White Sulphur Springs, W. Va.

Sept. 23-26—Association of Iron & Steel Engineers, 1958 Exposition and Convention, Public Auditorium, Cleveland.

Sept. 29-Oct. 3—Association Technique de Fonderie de Belgique, International Foundry Congress, Brussels and Liege, Belgium.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 13-15—American Gas Association, annual convention, Convention Hall, Atlantic City, N. J.

Oct. 15-16—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 16-17—All-Canadian Foundry Conference, Royal Connaught Hotel, Hamilton, Ont.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-30—Metallurgical Society of AIME, fall meeting, Cleveland.

Oct. 27-31—American Society for Metals, National Metals Exposition and Congress, Public Auditorium, Cleveland.

Oct. 30-31—Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 31-Nov. 1 — Northwest Regional Foundry Conference, Multnomah Hotel, Portland, Oreg.

Nov. 10-12—Steel Founders' Society of America, Technical and Operating Conference, Carter Hotel, Cleveland.

Nov. 20-21—National Foundry Association, annual meeting, Drake Hotel, Chicago.

Dec. 3-5—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Steel Conference, Detroit.

1959

Feb. 12-13—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 19-20—Southeastern Regional Foundry Conference, Hotel Tutwiler, Birmingham.

March 11-12—Foundry Educational Foundation, annual College-Industry Conference, Hotel Cleveland, Cleveland.

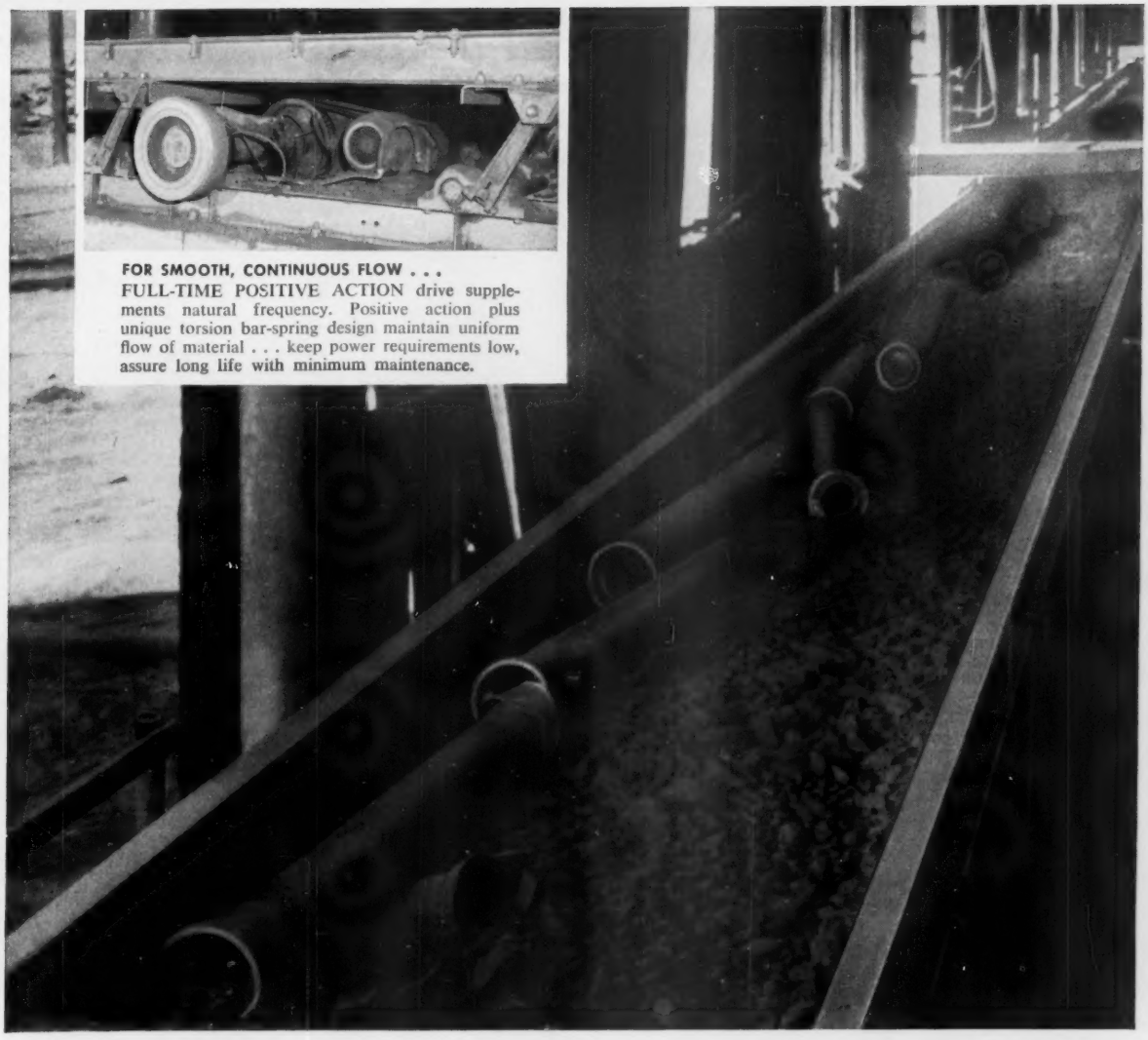
March 13-14—California Regional Foundry Conference, Huntington Hotel, Pasadena, Calif.

March 16-17—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

March 16-20—American Society for Metals, plus other technical groups, Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

April 13-17—AFS Castings Congress & Engineered Castings Show, Hotels Sherman and Morrison, Chicago.

May 25-26—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.



FOR SMOOTH, CONTINUOUS FLOW . . .
FULL-TIME POSITIVE ACTION drive supplements natural frequency. Positive action plus unique torsion bar-spring design maintain uniform flow of material . . . keep power requirements low, assure long life with minimum maintenance.

Handling "piping hot" castings with 83% less man-hours

LINK-BELT oscillating conveyor collects . . . conveys . . . cools red-hot pipe at Western Foundry Co.

Nothing less than a Link-Belt Torqmount oscillating conveyor could answer the requirements of Western Foundry Co., Tyler, Texas. Red-hot cast iron pipes had to be collected and conveyed from a line of automatic spinning machines to storage area. In addition, this foundry wanted a piece of equipment that would shake the sand out of the pipe as well as separate it from the castings. Link-Belt oscillating conveyor with *full-time positive action* performs all these functions . . . refuses to dampen under heavy surge loading conditions. The 141 ft. long conveyor line handles over 1700 five-foot pipes per shift, cooling them en route to storage.

This installation has also brought about tremendous manpower savings. Fifteen of 18 men tied up by previous methods have been freed for more productive jobs elsewhere in the foundry.

For further information on how heavy-duty Torqmount can benefit your foundry, call your nearest Link-Belt office. Or write for Book 2444.

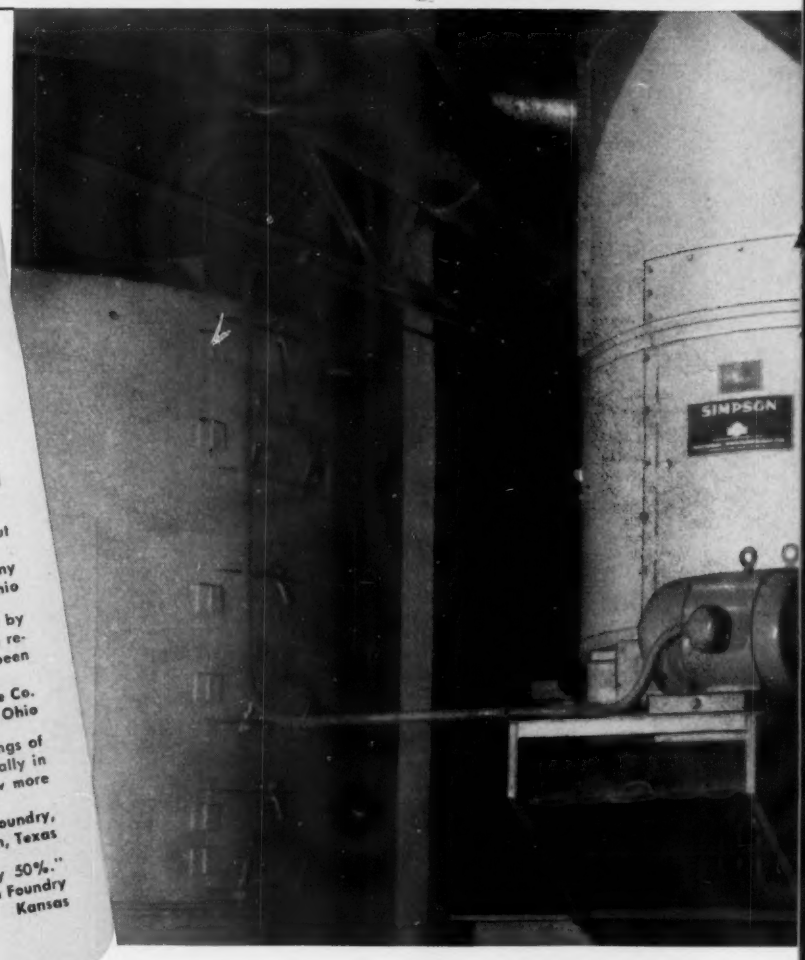
LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,084

Circle 567 on Page 103

One of a series on: **why practical foundrymen select**



Henry Furnace Company, Medina, Ohio
uses 50% less bonding material since installing 2F Mix-Muller.

American Abrasives Metal Co., Irvington, N. J.,
saved $2500 in bond alone during first year operating their 2F Mix-Muller.

Studebaker-Packard Corp. Manifold line
—Sand output tripled: sand quality improved . . . moisture control improved . . . since installation of 2½F Mix-Muller. Is one of 13 Mix-Mullers used at South Bend, Ind. Foundry.

"Use of bond in system has been cut by 50% with no loss in quality."
Superior Foundry Company Cleveland, Ohio

". . . our mulling cycle has been cut by 30% due to increased capacity and reduced mulling time. Facing has been eliminated."
Xenia Foundry & Machine Co. Xenia, Ohio

"Mixer has paid for itself in savings of costly materials . . . and principally in the fact that our results are now more consistently uniform."
Pioneer Foundry, Houston, Texas

". . . also reduced binder by 50%."
Grey Iron Foundry Kansas

How Simpson mulling principle can save you up to 50% in bond cost

When a batch of sand and bond is mulled the sand will achieve *most* of its green strength early in the process . . . But, *most* isn't always good enough to do all jobs. Scrap, inferior castings, wasted time, money and material are poor reward for a half mulled batch of foundry sand—when the total savings in mulling time may be less than a minute.

There is another way to save mulling time . . . *use a great deal more bond.* You'll get your strength but it will still be earned at the expense of questionable sand quality . . . and bond is costly.

Some foundrymen make a choice—time or bond, but many more *get both* by doing one of two things:

(1) Changing to Simpson Mix-Muller

(2) Using their present Mix-Muller wisely

These *practical* foundrymen know from experience, that they may mull a batch a little longer in a Simpson but they also know that, model for model, the Mix-Muller can turn out more, better sand in a given time than any other sand mixer!

Simpson MIX-MULLER by four to one

Yes, you can save on bond with the Mix-Muller

. . . up to 50% as reported by users—but you'll save in six other ways too. Combined, these savings mean much more to practical foundrymen than a few seconds saved in mulling. They are the reason why, for almost 50 years, Simpson Mix-Muller has been the choice of *practical* foundrymen by four to one over any other means of sand preparation.

ANOTHER!
PROVEN PRODUCT OF THE PRACTICAL FOUNDRYMAN BY NATIONAL

SIX WAYS YOU SAVE WITH MIX-MULLER

GET MORE FOR YOUR EQUIPMENT DOLLAR WITH MIX-MULLER

Model for model, you'll mix more sand—get more tonnage per hour with large capacity Mix-Muller.

SAVE RAW MATERIALS WITH MIX-MULLER

Only *true* mulling permits you to use lean mixtures. You'll make the most of *less* oil, binder and other additives—and get top quality sand at the same time.

YOU SAVE SCRAP WITH MIX-MULLER

True mulled sand cuts down on casting, mold and core scrap.

YOU SAVE CLEANING COSTS WITH MIX-MULLER

Uniformly coated sand means better finish—right from the mold with less cleaning time.

YOU SAVE POWER WITH MIX-MULLER

Mix-Muller takes only about ½ the power of other machines —to do the same or a better job. Only power required is used to plow and to roll mullers over the sand.

YOU SAVE MAINTENANCE WITH MIX-MULLER

Simple, rugged construction makes Mix-Muller easy to operate, maintain—and get parts for. Low speed mulling insures longer wear and part life to save you materials and man hours.

National Engineering Company, 646 Machinery Hall Bldg., Chicago 6, Ill.

Circle 568 on Page 103

WHY PAY MORE?

...WHEN YOU CAN BUY

STEEL-TYPE ABRASIVES

for $155 per ton

in 50 or 100 lb. bags Palletizing Available

Beach wear by Jantzen

"SEMI-STEEL" is a newly developed abrasive with steel shot characteristics. It is produced by an entirely new process, so efficiently, that it can be sold at malleable shot prices! "SEMI-STEEL" is manufactured as shot and grit, to S.A.E. specifications. Its performance compares so favorably to that of regular, high grade steel shot that, considering its extremely low price, you can't help but reduce your cleaning costs.

Now you can change to "SEMI-STEEL" abrasives and get a WRITTEN GUARANTEE from Metal Blast that you'll cut cleaning costs — no matter what steel abrasive you're now using! Reports from foundries using "SEMI-STEEL", plus our own laboratory tests, have convinced us that we can definitely guarantee savings in cleaning costs, over any other steel abrasive on the market.

"SEMI-STEEL" IS GUARANTEED TO CUT COSTS

FREE LAB TEST

We invite you to send us a sample of your present steel shot (at least 200 grams). We'll run a test on it, against "SEMI-STEEL", and report the results. Or, we'll gladly send a sample of "SEMI-STEEL" for testing in your own lab. (Give size required.) Either way you'll get welcome proof of "SEMI-STEEL" savings.

So, why continue paying high prices for steel shot cleaning? Write for more information on "SEMI-STEEL" — send in your sample or request our sample for testing. Take this first step toward savings, right now!

METAL BLAST, INC.

872 EAST 67th STREET · CLEVELAND 3, OHIO

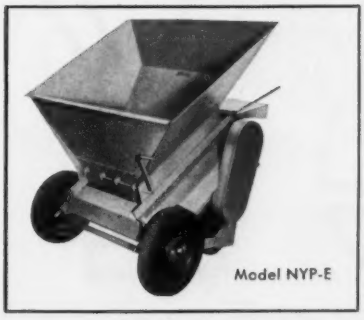
THE LARGEST INDEPENDENT MANUFACTURER OF ABRASIVES — STEEL-TYPE, CHILLED AND MALLEABLE

AERATE AND FLUFF AT MOLDING STATION FOR MAXIMUM BENEFITS

To take full advantage of the economies of central sand conditioning, highly mechanized foundries usually find it necessary to sacrifice other elements. Some of these are permeability, flowability and cooled sand.

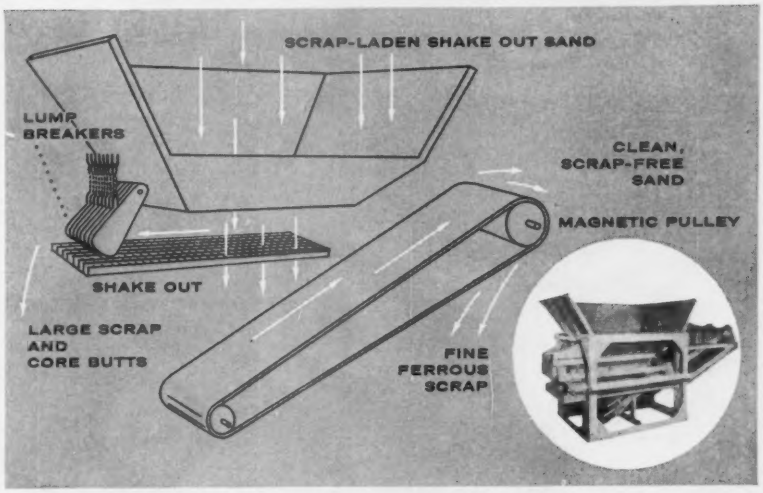
To produce the best possible molds, sand should be aerated and fluffed as the final operation before it is used. More and more, foundries with central systems are turning to Royer to help improve their sand's properties.

Thousands of foundries have increased the permeability of their molding sand 10 to 20 points by aerating at the molding station with a Royer Separator and Blender, like the Model NYP-E shown here. Besides eliminating the problems of packed sand, they gain the advantages of better flowability and cooled sand. Royerizing reduces new sand requirements and often eliminates entirely the need for facing sand. Castings have smoother finishes, too, reducing grinding and cleaning costs.



Royer Sand Separators and Blenders are available in sizes to fit any foundry need. This Model NYP-E handles the charge of a front-end loader. Other models are available with capacities as low as seven tons per hour.

Two bulletins describe the Royer line of Sand Separators and Blenders. Bulletin SS-54 covers machines from 7 to 60 tons per hour maximum capacities. Bulletin NY-54 describes the series engineered for high capacity sand handling systems. Write for your copy today.



Sand Contamination Drains Your Profits

Periodic business recessions in the foundry industry point up the need to eliminate waste and excessive hand labor—or sacrifice profits. In one area of foundry operation—sand contamination — important strides have been made in stopping the profit drainage.

Tramp iron damage usually occurs at the muller, conveyor belts, aerator or patterns. Patterns faced with contaminated sand produce poor casting finishes and high scrap loss. Probably the most efficient and economical way to remove contamination and produce clean sand is with a Royer Scrap Control Unit.

Referring to the drawing, shake out sand from the molding floor is dumped by front-end loader into the receiving hopper. Large scrap is riddled out by the Shake-Out and discharged at convenient wheelbarrow height for collection and removal.

Ferrous scrap small enough to pass through the grid openings of the Shake-Out is separated from the sand by a magnetic pulley at the upper end of the conveyor belt. Depending upon the degree of mechanization you employ, clean sand discharge may be made to a skip hoist feeding a muller, conveyor belt, or into the hopper of a Stationary Royer Separator and Blender for cooling, aeration and blending. We recommend discharge onto a heap for transporting by front-end loader to a Portable Royer Separator and Blender at the molding station for cooling, aerating and fluffing.

If tramp iron is the cause of any of your profit loss, we invite you to discuss your problem with the foundry-wise Royer agent serving your territory. He'll explain how a Royer Scrap Control Unit can pay for itself in less than two years, stop your profit drainage and improve the quality of your castings.

Your first step in stopping profit drainage caused by sand contamination is to mail the coupon for our latest Scrap Control Bulletin. We'll send it without obligation—plus the name of the agent who serves you.

ROYER FOUNDRY & MACHINE CO.

ROYER 159 PRINGLE STREET KINGSTON, PENNA.

Sand Contamination is cutting into our profits. Please rush me your Scrap Control Bulletin.

NAME_____

COMPANY_____

ADDRESS_____

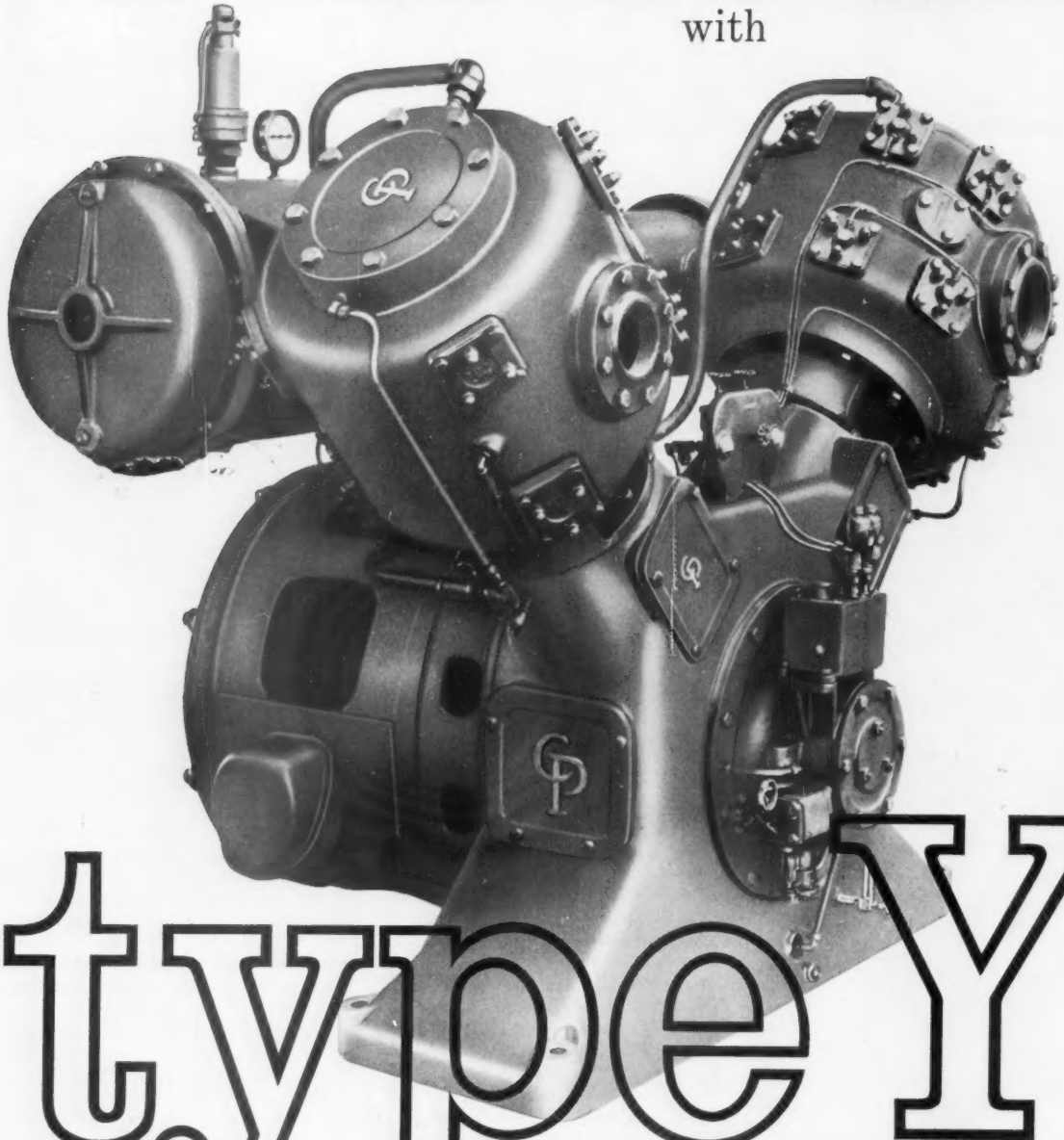
CITY_____ ZONE_____ STATE_____

Circle 570 on Page 103

Give your foundry

"THAT AIR OF DEPENDABILITY"

with



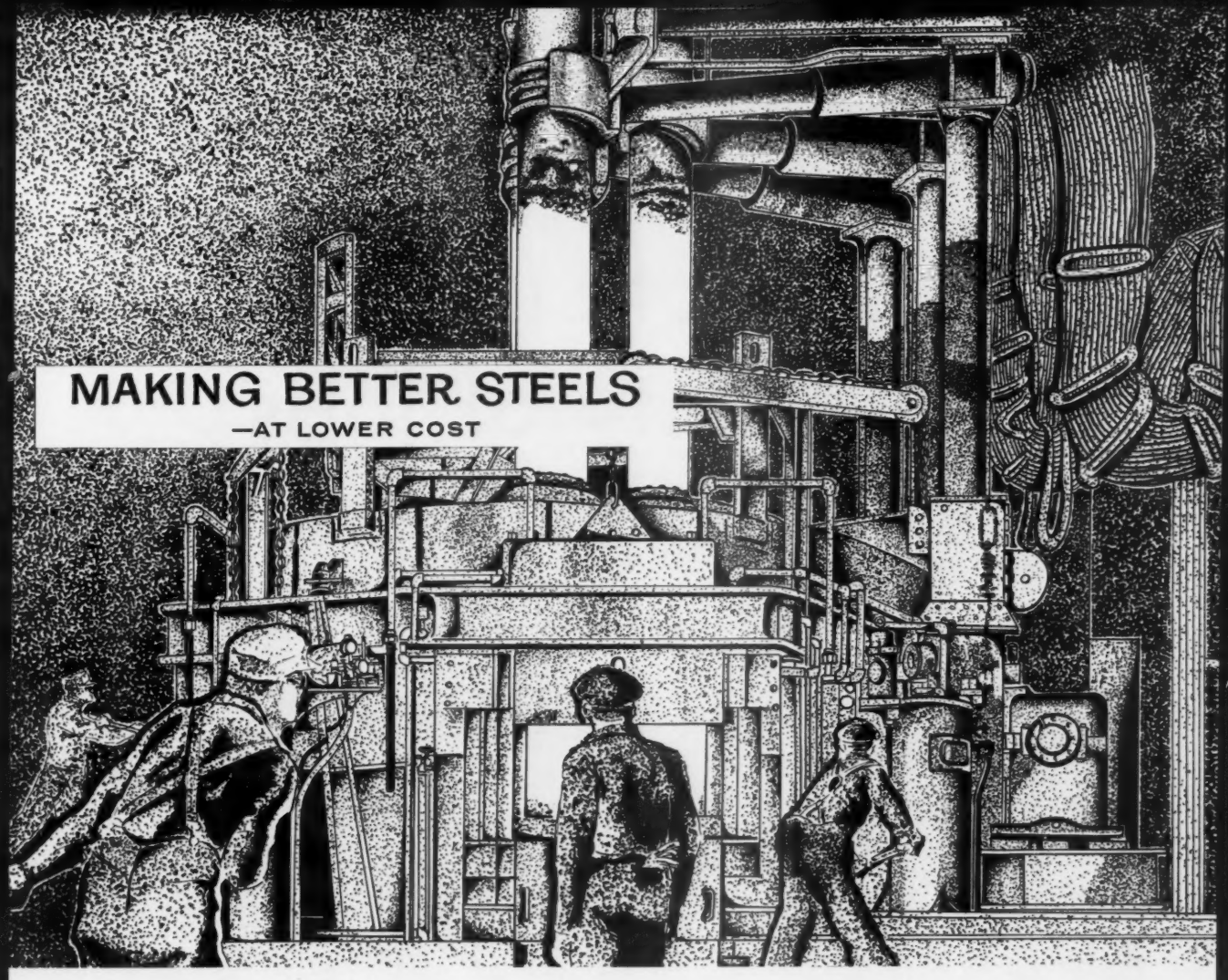
type Y

COMPRESSORS

• 75 to 250 Horsepower • Built-in motor, coupled, and belt drive • Simple, compact, widely adaptable, heavy-duty • Built for "round-the-clock service" with minimum of attention • Other types of compressors available in sizes to 5000 hp and pressures to 15,000 psig.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

AIR AND GAS COMPRESSORS • VACUUM PUMPS • PNEUMATIC TOOLS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS



ADDING ALLOYING ELEMENTS

. . . to the bath requires the experience of melters who know how to control the important factors of time, temperature and quantity. Skilled melters also know that a **GLC graphite column with the "weld-strength" Unitrode nipple** helps make better steel at lower cost.

FREE—*This illustration of one of the skills employed by the men who make the metals has been handsomely reproduced with no advertising text. We will be pleased to send you one of these reproductions with our compliments. Simply write to Dept. F-8.*

ELECTRODE GLC® DIVISION

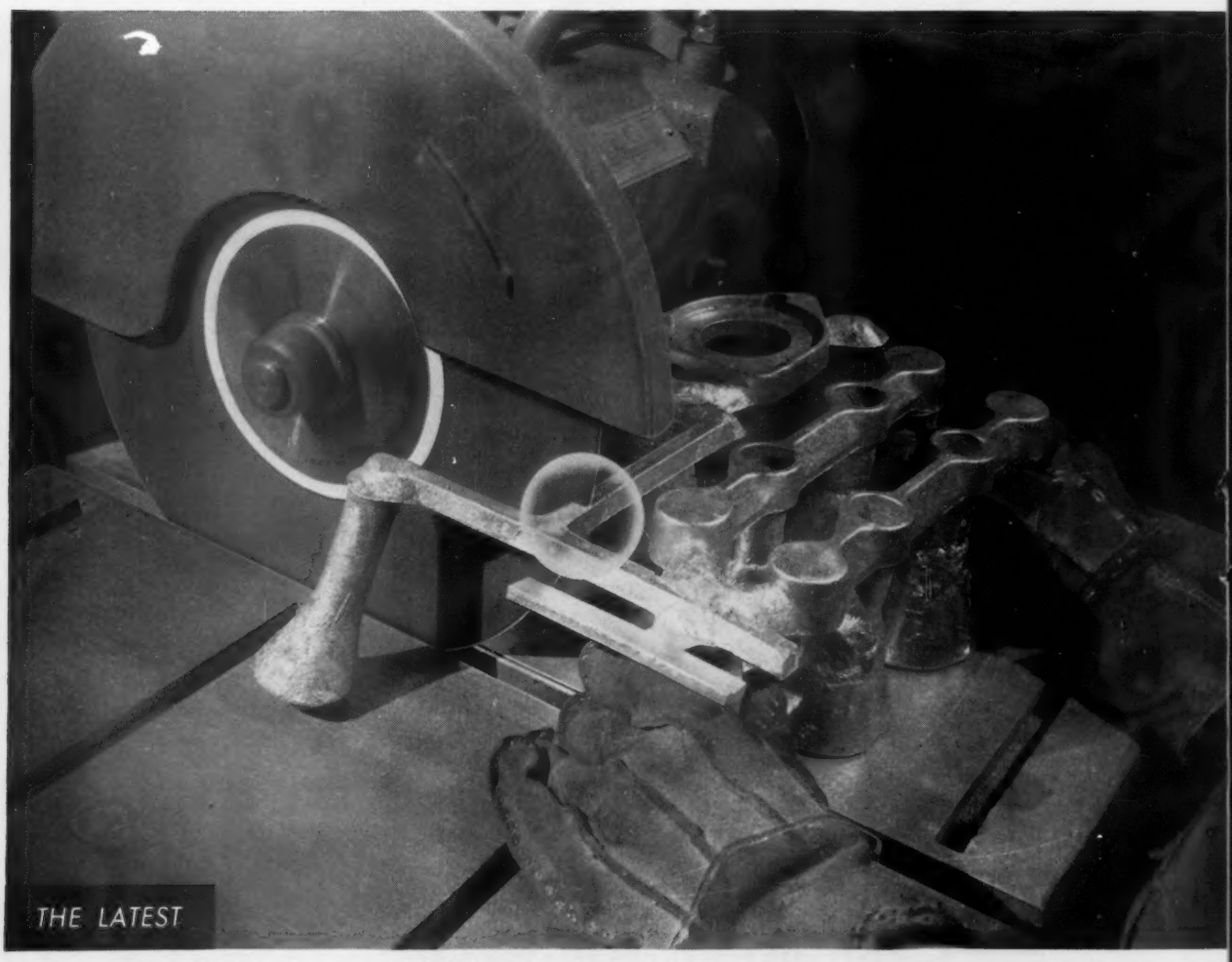
GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N.Y. OFFICES IN PRINCIPAL CITIES

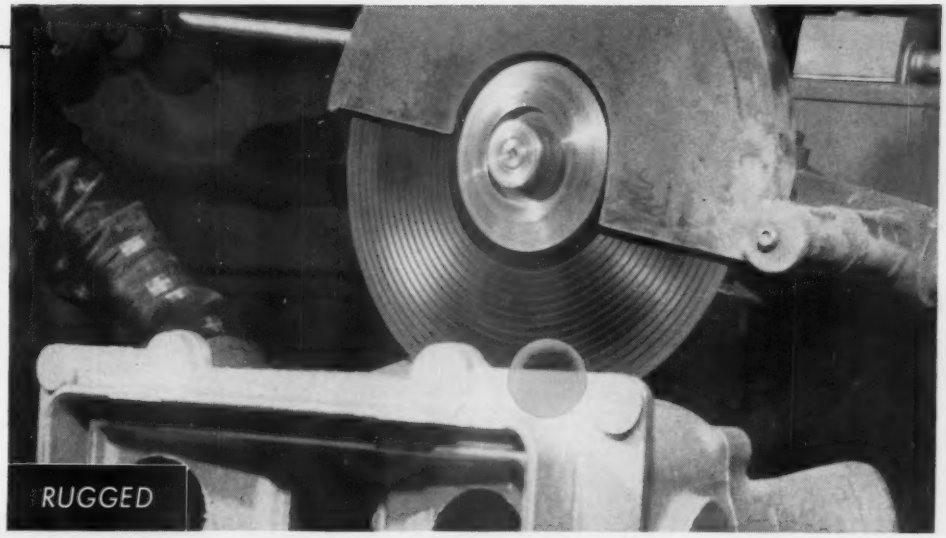
Circle 572 on Page 103

Plenty of strength for plenty of jobs

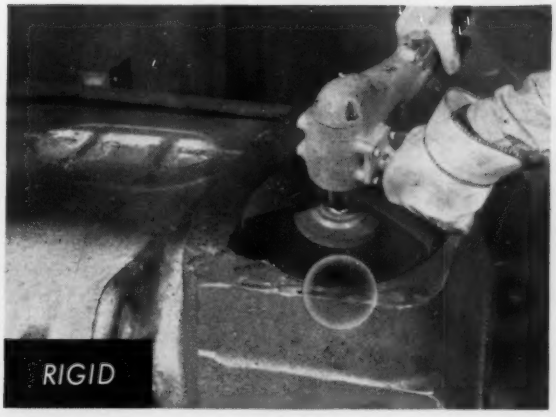
Norton builds the cost-cutting "Touch of Gold" into a complete line of Reinforced Wheels



RN Wheels — Glass Cloth. One of the newest Norton developments, the RN is rubber bonded, reinforced with glass cloth. A proved economizer in foundry use, it's well worth your investigation for lower cost cutting-off jobs on ferrous and non-ferrous metals.



BN Wheels — Glass Cloth. An especially rugged and durable resinoid bonded wheel for slotting and cutting-off non-ferrous metals, and many non-metallic materials. Also available in BNA type in 1/16" and 3/32" thicknesses in diameters up to 10".



BD Wheels — Glass-Nylon. The preferred hub type wheel for heavier stock removal. Ideal for cleaning between teeth of large gear castings, removing rust and scale, many slotting and cutting-off operations. In their wide job range they cut fast and last long.

BF Wheels — Cotton. These resinoid straight wheels with cotton fabric reinforcement provide the best combination for deburring, light finishing and many other light portable and bench grinding applications. For peripheral grinding only.

BFR Wheels — Cotton-Nylon. Popular for light snagging with portable grinders, these semi-flexible resinoid wheels have a web of cotton fabric, reinforced with nylon. For minor cut-off jobs, removing scale, light finishing, reaching hard-to-get-at places.

In this complete line of Norton reinforced wheels you get sizes, reinforcing webs and bonds in combinations that cover countless, routine foundry grinding jobs. See your Norton Distributor for further facts, aid in wheel selection, and prompt deliveries. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

W-1876

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 573 on Page 103

ROSS Air Systems

Engineered Atmospheres for Better Processing

SOLVING PROBLEMS IN CORE OVEN DESIGN

Significant Specified Operational Data:

Rated Capacity
15,000 pounds of sand (core molds) per hour

Baking Temperature
450°F.

Baking Cycle
4 hours (4 passes)

Cooling Cycle
2 hours (2 passes) with products delivered at 110°F.

Two Composite Parallel Baking and Cooling Units
66′ wide x 10′ high x 110′ long

Representatives:
W. Thomas Barr Associates,
P.O. Box 5832, Birmingham 9, Ala.

One would think that to design these units so as to create and hold these temperatures continuously within close tolerances hour after hour presented problems enough. But there were others that called for all the experience and ingenuity Ross Engineers could bring to bear, problems such as gas leakage into the working areas had to be avoided . . . an air seal vestibule did this. Or sealing off the cooling areas from the baking areas yet provide continuous travel . . . utilizing a natural heat seal took care of this problem. Or thorough and uniform distribution of both the processing hot air and the cooling outdoor air . . . overhead ducts and the Ross Special Nozzle System solved this one.

This entire core curing system, installed in a large automobile parts foundry, was designed, constructed and equipped by Ross Engineers. It comes well within the scope of their broad specialized service on Engineered Atmospheres because the design, creation and maintenance of closely held baking and cooling atmospheres is the heart of the problem. Many other industries have similar problems. Ross Engineers are serving those industries, too.

THE MIDLAND-ROSS GROUP OF COMPLEMENTING SERVICES

J. O. Ross Engineering, New York
John Waldron Corporation, New Brunswick, N. J.
Andrews and Goodrich, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton, Dayton
Hartig Extruders, Mountainside, N. J.
Carrier-Ross Engineering Company, Ltd., England

J. O. ROSS ENGINEERING DIVISION

Midland-Ross Corporation
444 Madison Avenue, New York 22, N. Y.
ATLANTA • BOSTON • CHICAGO
DETROIT • LOS ANGELES • SEATTLE

Circle 574 on Page 103

Circle 575 on Page 103→

WRIGHT HOISTS & CRANES

FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

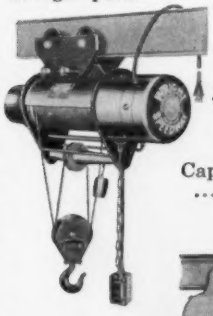
ACCO

WRIGHT *SPEEDWAYS*

Available with single, 2-speed or variable speeds and with a wide variety of mounting arrangements

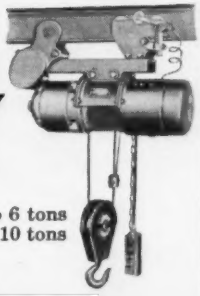
2-SPEED *SPEEDWAY* FRAME 1

Capacity ¼-ton to 1 ton. Two-speed, 1800/450 RPM motors permit precise, gentle positioning of work at slow speed... fast lifting and lowering at high speed.



***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.



***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

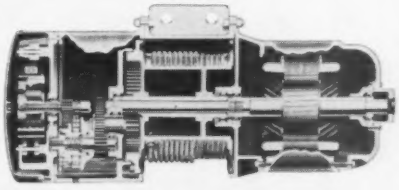
Long Life—Safety—Minimum Maintenance are assured by—

Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking—Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

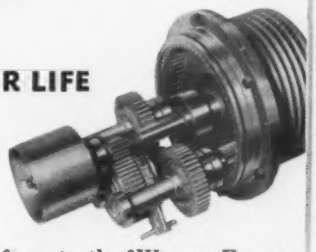
Capacities ¼-ton to 10 tons

your best buy for— MORE PRODUCTION



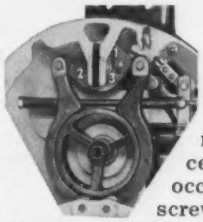
Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE



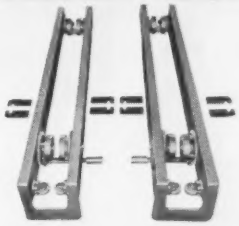
Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE



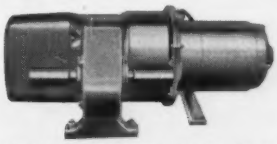
There is *"Nothing to Adjust but the Cam"* to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position **1**, swing the cam until Position **2** is in line and replace the screw. Position **3** is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS



WRIGHT END TRUCKS

For motor-driven cranes and hand traveling cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information *Write for these Booklets—*

DH-73A • New Electric Chain Hoist
DH-133D • Frame 1 *Speedways*
E-58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes
DH-227 • Underhung, Single Bridge
DH-448A & DH-449A • Top-Running
DH-431C • Crane Drive Units

Wright Hoist Division
AMERICAN CHAIN & CABLE

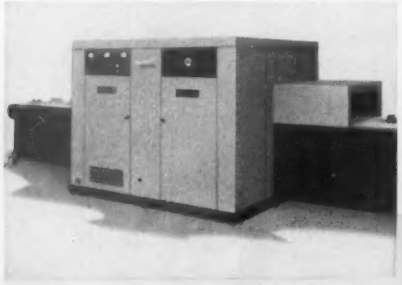
York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

FAST

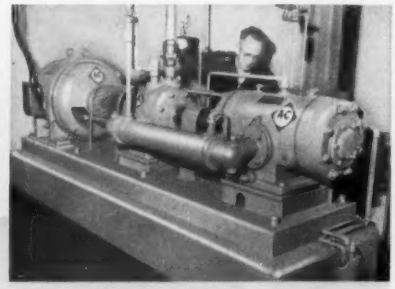
because the rated capacity of the *Foundromatic* Shakeout is over twice its weight

The extra reserve weight of Allis-Chalmers shakeouts assures fast core knockout or flask shakeout. Husky two-bearing, circle-throw construction means steady operation for years. Free-floating shakeout body is one-piece unit and the entire structure is stress-relieved after welding. Simple two-bearing mechanism ignores overloads. Oversized bearings last much longer.

Smooth stopping — Allis-Chalmers patented automatic control eliminates stopping bounce. It brings shakeout to a smooth stop by reversing current after motor has coasted to one-third speed. For all the details ask your A-C representative for Bulletins 07B6365B and 07B8141, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.



***Foundromatic* Dielectric Sand Core Oven.** There are 14 important advantages in using this fast, modern method of core baking — and each will save you money. Find out what they are. Bulletin 1587306D gives the complete story.

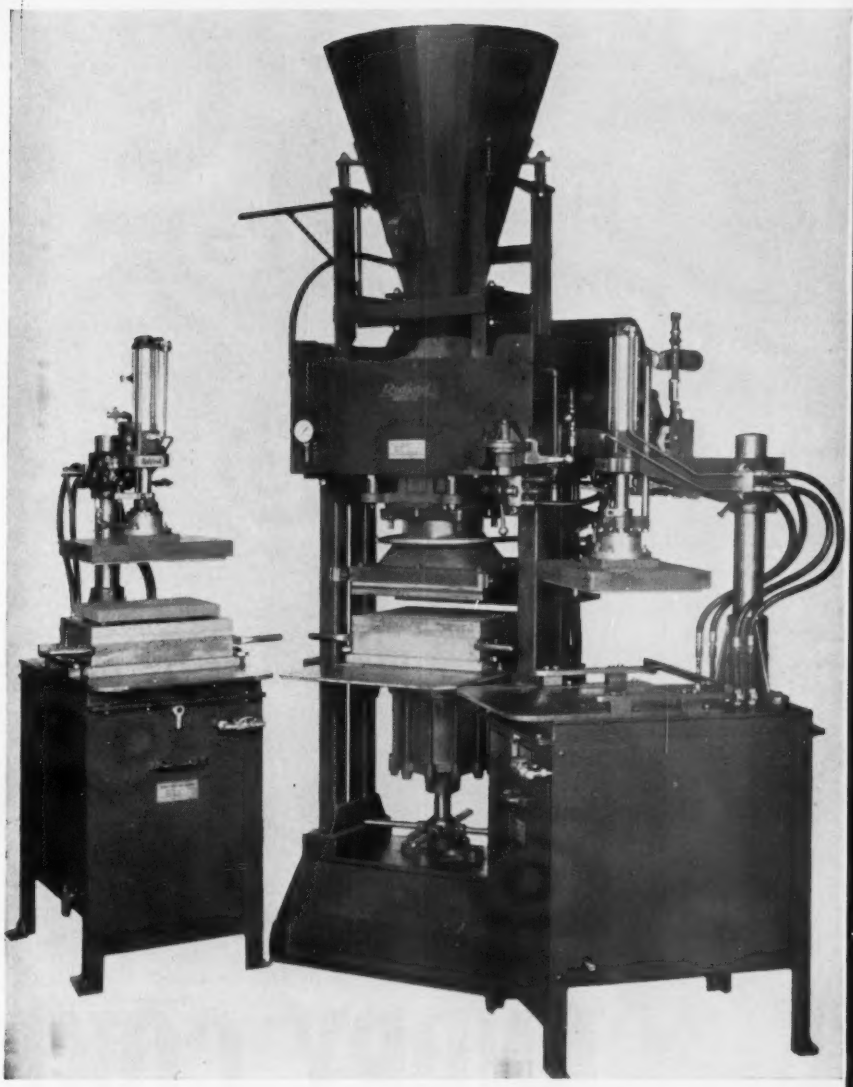


***Ro-Flo* Compressors for Foundry Air.** Sliding-vane design eliminates major causes of compressor trouble, maintains constant efficiency. Compact rotary units eliminate need for heavy foundations. Bulletins 1688244 (two-stage) and 1688126 (single-stage).

Foundromatic and *Ro-Flo* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-5740



REDFORD CO_2 MOLD MAKING EQUIPMENT

Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

Circle 577 on Page 103

NEVILLE FOUNDRY COKE

NEVILLE Foundry Coke is scientifically processed from clean, washed coals containing a high percentage of Pocahontas. We provide this extra measure of quality at the very beginning of our foundry coke production. And it carries right through to help you produce more high quality castings.

Neville Foundry Coke is a dense, strong uniform coke, with more fixed carbon and less ash and sulphur. That's why it consistently provides maximum melting temperatures which enable you to produce a hotter, cleaner, more fluid iron.

Neville Pig Iron and Neville Coke for the Foundry Trade

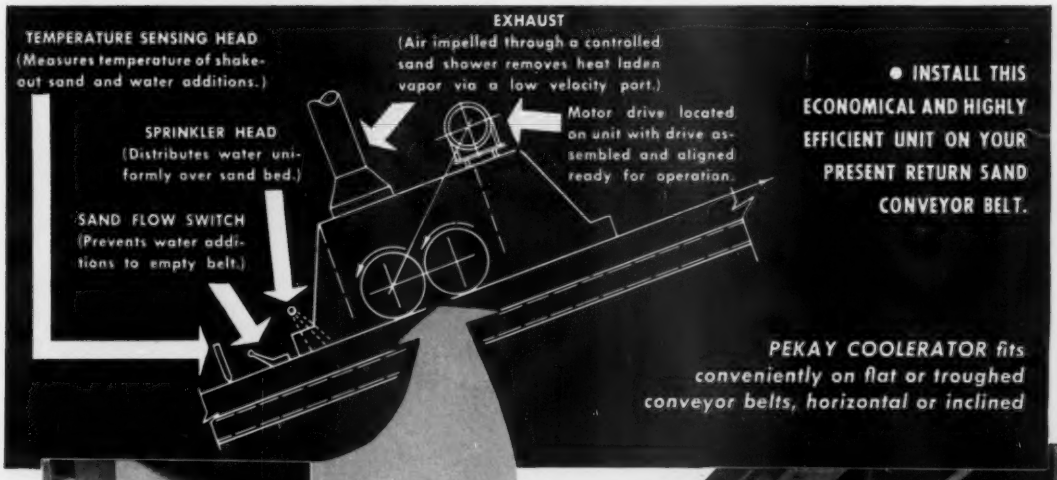
If you're interested in improving the quality and increasing the efficiency of your gray iron castings production, specify *Neville* the next time you order foundry coke. *And if you need any technical help, our engineers will be glad to meet with your production people.*

COKE • CEMENT • PIG IRON • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

(Advertisement)

NOW!

YOU CAN ELIMINATE THE HOT SAND PROBLEM IN YOUR FOUNDRY—WITH THE PEKAY COOLERATOR WHICH WILL EFFECTIVELY COOL MORE SAND PER DOLLAR INVESTED


TEMPERATURE SENSING HEAD
(Measures temperature of shake-out sand and water additions.)
EXHAUST
(Air impelled through a controlled sand shower removes heat laden vapor via a low velocity port.)
SPRINKLER HEAD
(Distributes water uniformly over sand bed.)
Motor drive located on unit with drive assembled and aligned ready for operation.
SAND FLOW SWITCH
(Prevents water additions to empty belt.)
• INSTALL THIS ECONOMICAL AND HIGHLY EFFICIENT UNIT ON YOUR PRESENT RETURN SAND CONVEYOR BELT.
PEKAY COOLERATOR fits conveniently on flat or troughed conveyor belts, horizontal or inclined

MIXING
(Rapidly revolving cutter wheels break all lumps, thoroughly, aerate and distribute moisture throughout sand.)

The **PEKAY COOLERATOR** installation at **CLARK EQUIPMENT COMPANY'S** Steel Foundry, Buchanan, Michigan, cools return sand from a peak of 250° F to 115° F at the rate of 60 T. P. H.

BENEFICIAL FEATURES OF THE PEKAY COOLERATOR

- *Rapid sand cooling without retention time* • *Reduce mixing time in mill*
- *Insure closer sand quality control* • *Increase conveyor belt life*
- *Simplicity of installation* • *Low operating and maintenance cost*

CUSTOMER SATISFACTION GUARANTEED

PEKAY MACHINE & ENGINEERING CO. INC.

869 N. SANGAMON STREET **CHICAGO 22, ILLINOIS**

Specialists in foundry sand conditioning and handling, slurry systems, engineering and equipment

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY AND STATE_____

I would like information on:

- ☐ Pekay Mixer Mullers
- ☐ Pekay Coolerator
- ☐ Pekay Sand Systems
- ☐ Pekay Airators
- ☐ Pekay M-T-Matic Buckets
- ☐ Pekay Positive Mold Counters

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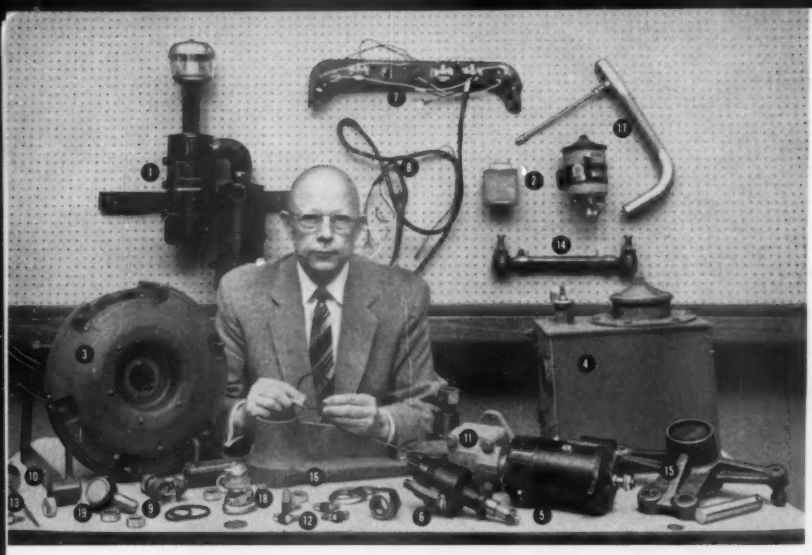

"Why are so many PROTECTIVE features engineered into the new H-25 PAYLOADER?"

This question is frequently asked of Ralph Beyerstedt, Executive Vice President of The Frank G. Hough Co. because of his more than twenty years of experience in charge of engineering.

"During the development of the H-25," Mr. Beyerstedt explained, "as soon as it became evident that we were going to obtain the increased capacity, production, ease of operation, speed and mobility we sought, our engineers then gave major attention to protective features for operational insurance against wear, maintenance, abuse, downtime and the like.

"The more than 10,000 small HA 'PAYLOADER' tractor-shovels that we have produced for steel mills, foundries and chemical and fertilizer plants operate under conditions which continuously subject the machines to dust, dirt, powder and foreign materials.

"Because these are sources of major headaches for owners and operators," said Mr. Beyerstedt, "we have given extra special consideration to elimination of the problems they cause."

Dozens of Protective Features

"Starting with the *triple* air cleaning system (1) we have provided a precleaner and dual oil-bath air cleaners for engine intake, and crankcase breather tube (17).

"Next, each of the three oil systems is equipped with a cartridge-type oil filter (2). These take care of the engine oil, the hydraulic-system oil, the power-shift transmission and torque-converter oil.

"The self-adjusting, hydraulic service brakes (3) are *sealed* and the parking brake is enclosed in the transmission, operates in oil for greater dependability.

"The reservoir (4) of the closed, pressure-controlled hydraulic system has built-in cartridge-type filter and *sealed* dip-stick."

In discussing the components of the electrical system, Mr. Beyerstedt said, "There is a 12-volt system with the battery grounded direct to the starter housing; a non-vented, *sealed* generator (5); *sealed* ignition distributor (6); shock-mounted instrument panel (7) with solder-coated terminals and a plastic-coated wiring harness (8); *sealed* circuit breaker together with *sealed* ignition and starter switches (9) plus clutch-pressure warning device (18).

"*Sealed* teflon bushings are used extensively throughout with brake and transmission disconnect mechanism (10) and valve control mechanism (11).

"These *sealed* ball joints (12) are used with gearshift linkage and *sealed* ball joints of a different size (13) are used with the accelerator linkage.

"The steering linkage uses *sealed* ball joints on the tie rods (14), and on the drag link (19). The steering bell crank (15) is *sealed*, also the spindle and kingpin assemblies.

"The boom arm mechanism has tapered roller bearings and dust covers on the bell cranks (16) and *sealed* mated bronze and steel bushings plus O-ring seals at all major pivot points."

Now, What About Production?

The carry capacity of the H-25 "PAYLOADER" is 2,500 lbs.—25% greater than has ever before been available in a tractor-shovel of its size and maneuverability, yet it easily loads and unloads box cars with narrow 6-foot doors. It is the only loader in its size range with *complete* power shift transmission—having 2 speed ranges forward and two in reverse. Power-steer is also standard so that operating speed and handling ease favors all-out production all day without operator fatigue.

Other plus features of the H-25 that mean more production, less maintenance and longer life are the exclusive power-transfer differential, wet-sleeve overhead valve engine, full-shift fuel capacity, 4,500 lbs. of bucket breakout force and 40° bucket tip-back at ground level.

Your "PAYLOADER" Distributor wants to show you how the greater capacity, speed and handling ease of the H-25 can cut your bulk-handling costs. Ask him about Hough Purchase and Lease Plans, too. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.

8-A-1

The H-25 "PAYLOADER" is effectively shielded against dust, dirt and foreign materials.

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News Views

CONTINUING UPTURN: Momentum of the recent pickup in business will continue, according to the Business Survey Committee, National Association of Purchasing Agents. Asked whether general business in the last half of 1958 would be better, the same as, or worse than it was during the first half, 69 per cent said better, 29 per cent said the same, and only 2 per cent said worse. Many qualified their enthusiasm by saying there will be no vigor to the upturn until after the summer lull. This survey preceded the current Middle East crisis, which may hasten the resurgence of business activity.

For the foundry industry, there are some encouraging indicators. The high rate of farm prosperity should stimulate buying of farm equipment, and residential construction is at a rate of more than 1 million starts this year. The auto plants are entering their closedown periods for model changeovers, but after that slump, new car sales should pick up. The reduction in the transportation excise tax on freight may encourage some buying on the part of the nation's railroads, which need equipment badly but have not been ordering it. Consumer buying of durable goods has been down 10 per cent or more this year, but a return of confidence may set off renewed purchasing of such products.

AFS ELECTS DIRECTOR: The Board of Directors, American Foundrymen's Society, has selected J. H. King, president of Archer-Daniels-Midland Co. Ltd., Toronto, to fill the unexpired term of the late Alex Pirrie as a national director. Mr. King is a past chairman of Ontario Chapter of AFS.

NICKEL PLENTIFUL: A survey by International Nickel Co., New York, indicates no return of the nickel shortage which ended only last year. Inco estimates Free World nickel production capacity in 1958 at approximately 525 million lb, or about 115 million lb more than total 1957 Free World consumption and about 35 million more than total 1957 Free World deliveries. Inco and U. S. Government stocks of unconsumed nickel on hand in North America and available to consumers on April 30, 1958, were estimated at 112 million lb and still growing. Consumers' inventories at the same date were estimated at 32 million lb. Inco estimates that by 1961, Free World nickel production capacity will have risen to about 650 million lb.

CHANGES HANDS: Consolidated Iron-Steel Mfg. Co., Cleveland, has acquired Ohio Foundry Co.'s plant and equipment at 2469 E. 71st St., Cleveland, and also the equipment at Ohio Foundry's plant at 9812 Quincy Ave., Cleveland. The Quincy Avenue property has been leased to Carling Brewery Co., Cleveland. Consolidated will combine the light foundry operations of Ohio Foundry with its Taylor & Boggis Div., Euclid, Ohio. Henry J. Trenkamp and Henry Trenkamp Jr. will become executives of Consolidated's new Ohio Foundry Division.

GE LABORATORY: General Electric Co. has placed the $3¾-million Applied Research & Development Laboratory of its Foundry Dept. at Schenectady, N. Y., in full operation. The 22,000-sq-ft laboratory is designed to provide the link between pure research from which new materials and processes are developed and the actual foundry use of those materials and methods in castings and in improved production techniques.

PERSONALS: Dr. Thomas J. McLeer has rejoined Cooper Alloy Corp., Hillside, N. J., and will direct its research and development activities . . . James H. Lansing has resigned as technical director of the Malleable Founders' Society, Cleveland, and is engaged in consulting work for various foundries . . . Electric Steel Foundry Co., Portland, Oreg., has appointed Joe E. McQuaid general sales manager, Dar G. Johnson Jr. assistant general sales manager, and Robert L. Zwald advertising manager . . . Realignment of its field sales organization by Monarch Aluminum Mfg. Co., Cleveland, has produced these assign-

ments: Gerald C. Liebel, eastern territory; Joseph Shrier, central territory; and Manley S. Hutchinson, western territory . . . Charles W. McLennan has resigned as vice president and general manager, Lynchburg Foundry Co., Lynchburg, Va.

CLOSINGS: Cutler-Hammer Inc., Milwaukee, will discontinue its foundry this summer . . . C. W. Olson Mfg. Co., Minneapolis, has closed its foundry operations.

OBITUARY: George H. Jewell, 76, retired vice president, Glamorgan Pipe & Foundry Co., Lynchburg, Va., July 15 . . . Grover C. Johnson, 68, owner, East Texas Foundry & Machine Co., Marshall, Tex., July 11 . . . Howard E. Shelton, 73, formerly of Shelton Foundry, Paducah, Ky., July 7 . . . Theodore V. Wood, vice president and general manager, R. D. Wood Co., Philadelphia, and Florence Pipe Foundry & Machine Co., Florence, N. J., July 2 . . . Milton T. Smith, 57, retired president, Marion Power Shovel Co., Marion, Ohio, and former vice president, Bucyrus-Erie Co., South Milwaukee, Wis., in Charlottesville, Va. . . . James R. Fergusson, 75, president, J. R. Fergusson Co., Dundas, Ont., foundry, July 7.

MISCELLANY: Marine Bronze Mfg. Co. has been established in Evansville, Ind., to manufacture bronze tablets, marine hardware, plumbing hardware, and special ornamental work. Edward Wood is president . . . Acos Villares S. A., Sao Paulo, Brazil, has signed a $1.7 million credit agreement with the Export-Import Bank and will use the credit to buy foundry, rolling mill, and forging machinery and equipment in the United States . . . DeVilbiss Co., Toledo, Ohio, has formed a new wholly owned subsidiary, DeVilbiss Metal Fabricators Co. Detroit, through consolidation of Peters-Dalton Div., Detroit Harvester Co., Detroit, and Newcomb-DeVilbiss Co., Detroit. Both manufacture finishing systems . . . Malleable Founders' Society, Cleveland, has revised its estimate of 1958 malleable shipments downward from 865,000 tons to 680,000 tons. Decreased demands for automotive and railroad castings account for most of the drop . . . After three months of steady increases, bookings of material handling equipment manufacturers turned down slightly in May. R. L. Fairbanks, president, Material Handling Institute, feels, however, that dollar volume of orders for such equipment during the fourth quarter will exceed those for the same period of 1957.

Prices of Foundry Metals and Coke

(As of July 23, 1958)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$23.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.00; tin bronze, No. 225, 36.00; No. 245, 30.75; High-leaded tin bronze, No. 305, 31.25; No. 1 yellow, No. 405, 22.75; manganese bronze, No. 421, 24.50.

ALUMINUM: 99 per cent plus primary ingots 26.10. Secondary No. 12 alloy, 21.25-21.50. Deoxidizing grades: No. 1, 22.25; No. 4, 17.25.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 26.50, delivered Connecticut valley.

ZINC: High grade 11.00, delivered. Die casting alloy No. 3, 12.75; No. 2 13.25, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$31.00-32.00	$52.00-53.00	.....	.....	.....	.....	$49.00-50.00
Boston*	**22.00-23.00	**28.00-29.00	.....	.....	**36.00-38.00	.....	.....
Buffalo	27.00-28.00	**38.00-39.00	.....	.....	**42.00-43.00	.....	52.00-53.00
Chicago	41.00-42.00	42.00-43.00	.....	48.00-49.00	48.00-49.00	54.00-55.00	57.00-59.00
Cincinnati*	**35.00-36.00	**40.00-41.00	**32.00-33.00	.....	**44.00-45.00	.....	52.00-53.00
Cleveland	38.00-39.00	42.00-43.00	33.00-34.00	42.00-43.00	47.00-48.00	60.00-61.00	57.00-58.00
Detroit*	**28.00-29.00	**37.00-38.00	28.00-29.00	37.00-38.00	.....	.....	.....
Los Angeles	32.00	**41.00	.....	.....	.....	.....	.....
New York*	30.00-31.00	35.00-36.00	33.00-34.00	.....	.....	.....	.....
Philadelphia	35.00	38.00	41.00	.....	47.00-48.00	58.00-59.00	55.00-56.00
Pittsburgh	37.00-38.00	40.00-41.00	.....	39.00-40.00	49.00-50.00	.....	54.00-56.00
St. Louis*	33.00	43.00	34.00	44.00	.....	.....	50.00
San Francisco	32.00	42.00	28.00	40.00	40.00	.....	.....
Seattle	30.00	31.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

For Cleaner Surfaces, Better Shakeout, Try WHITEHEAD'S NEW HYGEIA LYQUAFLOUR

Our new plant at Irwin, Pa., is producing the improved DUSTLESS, DOUBLE STRENGTH HYGEIA LYQUAFLOUR. The compound of a special hydrocarbon and woodflour improves castings and mold conditions for all types of metal. Highly recommended for the advantages listed below:

- One sand additive controls both peel and expansion
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- Imparts highest flowability to sand mixture to give pattern true finish
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- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
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- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

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JOINT SEAL
Plastic compound for perfect sealing

LYQUAFACE
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DOB-IT
Ready-to-use core mudding compound

Circle 581 on Page 103

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Circle 582 on Page 103

Readers' Comment

What the Industry Needs

To the Editors:

I see the foundry industry is up and doing things. Recently I received from Pete Rentschler the new *Gray Iron Castings Handbook*. It is a fine job and Charlie Walton and his cohorts are to be congratulated on their accomplishments.

Recently I also received from the SFSA a notice about their *Steel Castings Handbook* and about their new film, "Photoelastic Studies of Joined Sections in Steel Castings and Weldments." My congratulations to them for the use of an up-to-date research tool. Then, too, there is the new *Cast Metals Handbook* of the AFS. All of these are very worthy endeavors by the casting industry. Despite all these and other worthy efforts, it seems the casting industry nullifies them by other activities in which it either does or does not engage.

During the more than 20 years that I worked in the casting industry, from special apprentice to various other capacities with American Steel Foundries at its Alliance, Ohio, and Hammond and East Chicago, Ind., plants, and as director of the technical development program and assistant secretary of AFS, I always believed, and still believe, the casting process to be the cheapest and best forming process, providing its many variables and difficulties can be investigated and understood thoroughly. Thus far, little has been done by the castings industry to investigate the basic properties of either the metals it produces or the materials it uses. What has been done has been accomplished by sporadic effort and not concentrated research.

For example, there seems to be little more data on the fatigue of cast metals in the new issue of the *Cast Metals Handbook* than there was in the old edition. Yet there is an increasing trend in machine design to use fatigue strength as a criterion of design.

Gray iron is usually classed as a brittle material. Many designers seem to use 5 per cent elongation as the dividing line between brittle and ductile materials. Is this satisfactory to the gray iron portion of the cast metals industry? Are there advantages to brittle failure, other than the type failure by fatigue? If so, have these been emphasized by the gray iron people? Has any attempt been made to make an asset out of a potential liability?

Then, too, foundrymen are too prone to broadcast their troubles, especially those relating to defects. In my humble opinion, this is poor psychology. Open discussion and publication of results of conferences on causes of defects result in such statements as the following:

> "Under similar circumstances, a lower factor of safety may be used for ductile materials than for brittle materials. This is true because the brittle materials are ordinarily those which have been cast and are more likely to contain hidden flaws or unknown stresses set up during solidification and also because brittle materials do not yield at points of high local concentration of stress." *Design of Machine Elements*, by Virgil Moring Faires, professor of Mechanical Engineering, North Carolina State College.
>
> "Ordinary cast iron is weak in tension and shear, although very strong in compression; it may contain hidden blowholes and internal stresses set up in cooling." *Principles of Machine Design*, by Samuel J. Berard, Brown University; Everett O. Waters and Charles W. Phelps, Yale University.

Both these books are texts used by many reputable colleges and universities. Since students accept as "gospel" anything in the text, think of the impression such statements make on the students' minds! Do foundrymen think such statements which originate from too blatant broadcasting of defects in castings, or from a poor experience with cast products, are helping to sell their product? I don't think so.

I have worked in other metalworking industries than the casting industry. You do not hear the rolled, extruded, or powder metallurgy people broadcasting the defects in their products. And they have them! Such metalworking industries extol the virtues of their product and, at the same time, *quietly* work to prevent the laps, folds, seams, segregation, etc., which occur at times in the products of their respective fabrication methods. In my opinion, the foundry industry should work endlessly and *quietly* to correct the shortcomings

of its product—for the foundry industry produces only one product, namely castings, regardless of whether they are brass, bronze, aluminum, steel, gray iron, etc., even though they are competitive in application. Not until a difficulty or defect can be created and corrected at will, will there be a complete understanding of its cause.

Let's look at something else. The first problem in a book on machine design asks the student to compare the dimensions of a link made from steel, malleable iron, and gray iron. AISI C1045 steel, 35081 malleable iron, and class 30 gray iron are specified. Unless my mind fails me, some 15 years ago Jim MacKenzie conducted a survey for ASTM and found the average strength of gray iron produced to be class 35. If the gray iron industry has not made any progress in that period of time, I shall be very much surprised. Time and again in problems I am forced to point out to the students that class 20 gray iron is the exception, not the rule.

The foundry industry "points with pride" to the fact that casting is probably the most ancient method of metal shaping. Let us not forget that the same makes it the most vulnerable to loss of market by new methods of metal forming. If, as a whole, the industry does not engage in more research and considerably more propaganda and public relations regarding its product, it probably will find itself, in time, relegated to a minor spot among the basic industries. Already I have seen such statements from educators as, "There is too much cast iron in our laboratories."

NORMAN F. HINDLE
Head
Mechanical Engineering Dept.
Moscow, Idaho
University of Idaho

Would Like Credit

TO THE EDITORS:

We believe that credit should have been given to Pekay Machine & Engineering Co., Chicago, as the manufacturer of the continuous muller installed at Aluminum Co. of America's green sand foundry in Cleveland and described in the article "Automatic System Conditions Aluminum Molding Sand," starting on page 150 of the April, 1958, issue of FOUNDRY.

CONRAD MICHALOWSKI
Vice President
Pekay Machine & Engineering Co.
865 N. Sangamon St.
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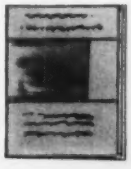

For practical suggestions on how to achieve higher blast cleaning efficiency and lower cleaning costs, write to the Wheelabrator Abrasive Division. Ask for Bulletin 902-D.

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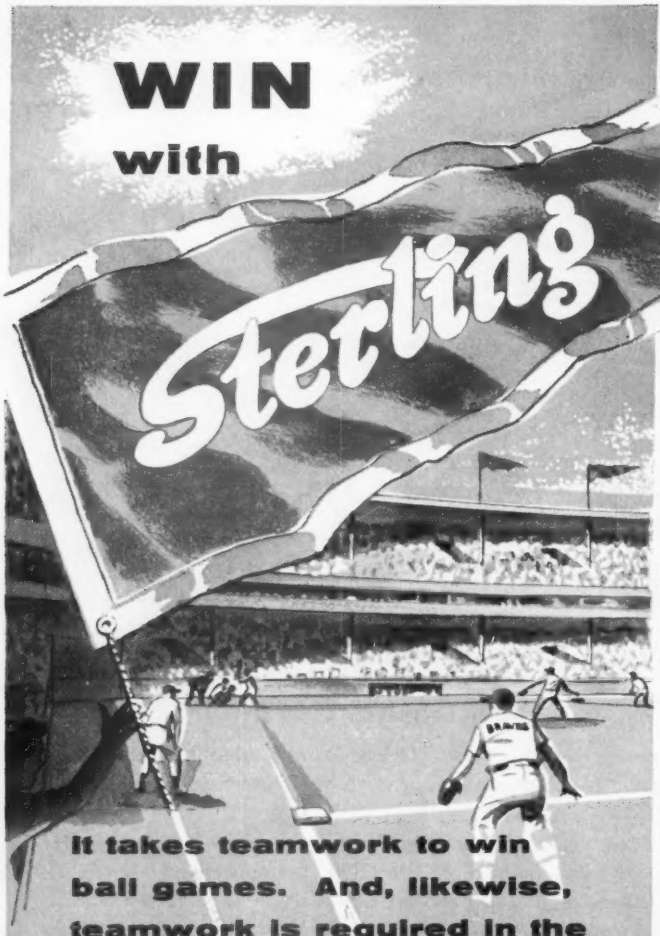
Circle 583 on Page 103



It takes teamwork to win ball games. And, likewise, teamwork is required in the selection of flasks and other equipment for your foundry.

Sterling National Industries maintains an extensive nationwide branch and dealer organization anxious to "go to bat" for you, anytime — twelve months of the year.

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WHEREVER METALS ARE CAST . FOUNDRY
August 1958

Take a New Look

Manufacturing problems were being discussed recently by three men riding downtown from a large airport. One remarked that his company had completed its plans for a new foundry, but that construction was being delayed until the economic situation improved.

The second stated that his company was finding it necessary to scatter production of its machines in several plants. A new manufacturing facility has been planned, but the start has been held up while the firm waits for better business.

After listening to these comments, the third man suggested that if many companies are holding up expansion or modernization plans in this manner, all hell could break loose if a substantial increase in business developed and each company undertook its plans for improvement at about the same time.

Both the foundryman and the machine manufacturer regarded this danger as a distinct possibility. A sudden spurt in demand might release building and equipment purchase plans that could make deliveries of equipment for all types of manufacturing most difficult to meet.

Undoubtedly many foundrymen have been considering improvements, including new plants, better equipment, or rearranged facilities. But rugged times in the entire metalworking industry, strengthened partly by postponement of capital goods buying, have resulted in the temporary shelving of these ideas. In the meantime, forces may be developing which will stymie action when it is most desired.

Regardless of the business situation and the softness in orders for castings, now may be the time for foundrymen to take a new look at every type of improvement program.

Changes in layout or the installation of equipment can be accomplished better and more economically during low operating periods.

Improvement in practice and facilities also should help meet today's extremely competitive prices. It should permit the production of a better product—one which more closely meets the needs of the customer. It will enhance the company's position in securing future business. In addition, it could provide assurance of preparedness in a world jittery because of recurring crises.

As pointed out in our May, 1958 issue in the special report "Are You Paying for Equipment You Do Not Have?" action now in improving your operation may be the deciding factor in determining whether you will be around to participate in the next big surge in casting demand.

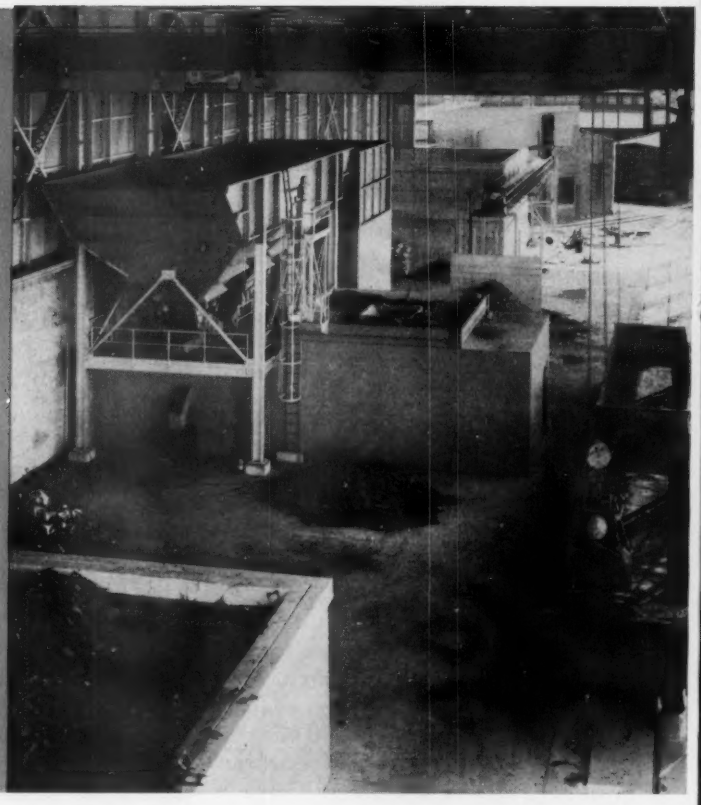
Why not take a new look at improvement possibilities?

Frank G. Steinebach

Editor

Link-Belt's New Foundry Provides...

EFFICIENT OPERATIONS



Covered material storage and charging yard adjacent to the new foundry measures 80 x 300 ft

Standard and pearlitic malleable castings weighing up to 70 lb are produced in green sand and shell molds in this recently completed mechanized foundry. Production operations are described

By ROBERT H. HERRMANN
Associate Editor

LINK-BELT Co.'s new malleable iron foundry at the Ewart Works, Indianapolis, produces in a 90,000-sq-ft area as much casting tonnage as previously was turned out in its old foundry, which covered 140,000 sq ft.

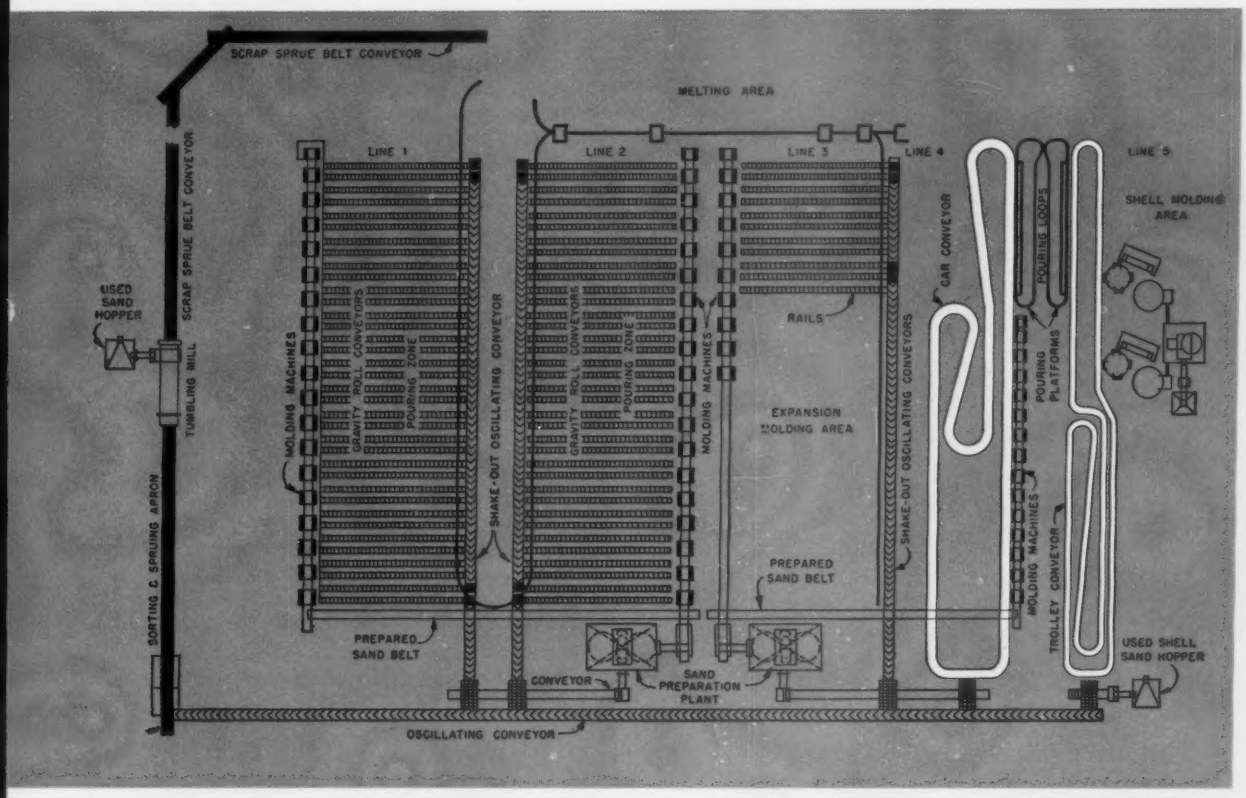
A roofed metal and coke storage area of 27,500 sq ft adjoins the new building. Extensive rearrangement of casting cleaning equipment and addition of new equipment are under way in 40,000 sq ft of an older building to provide equal space for hard and soft iron cleaning and inspection areas.

Link-Belt completely designed and engineered the new foundry, including its material handling equipment and two shell molding systems. The foundry is designed for a one-shift production of 1250 tons of standard and pearlitic malleable castings monthly. Production is in green sand and shell molds, and castings range in weight from 0.02 to 70 lb.

A large percentage of the castings produced are used in Link-Belt products. They include detachable links for chains used in material handling and power transmission equipment, plus buckets, gears, sprockets, and miscellaneous conveyor parts. Remainder of capacity is for jobbing production of malleable castings within the size range limits of the foundry. This production has included castings for small tools, farm equipment, valves, and electrical goods.

Cupola Charging and Melting—A 10-ton bridge crane traversing the covered metal and coke storage area unloads cars on a railroad siding which enters the area. It also is used to fill storage bins and make up cupola charges. A cone-bottom charging bucket resting on an electrically propelled car is positioned under weigh hoppers in the charge make-up area. The metal charge, previously made up in the weigh hopper by the bridge crane, is dropped into the bucket through pushbutton control by an operator stationed at a control panel inside the foundry. He also controls the car movement and the weighing and dropping of coke and limestone charges.

The car then is moved under the limestone and coke weigh hopper. Vibrating feeders under over-



Molding section has stationary conveyor mold set-off areas and car conveyor line for green sand and trolley conveyor line for shell molding

head bins supply these materials to the hopper. The car carries filled buckets under a pendant-controlled 4-ton charging crane which lifts the bucket and moves it into the charging door of either of the two cupolas. These are hot-blast units, slagged at the front into sluices, lined to 54 in., and boshed in just above the tuyeres to 48 in. They also are fitted with wet-type fly ash collectors.

The cupolas are used on alternate days and each melts 15 tons an hour. A typical metal charge consists of approximately 52 per cent remelt, 40 per cent steel scrap, and 8 per cent pig. Coke is added to provide a ratio of 12 to 1. Metal is tapped into the air furnaces at 2780° F, and carbon content of iron at the spout is 2.75 per cent. Analyses are made every hour.

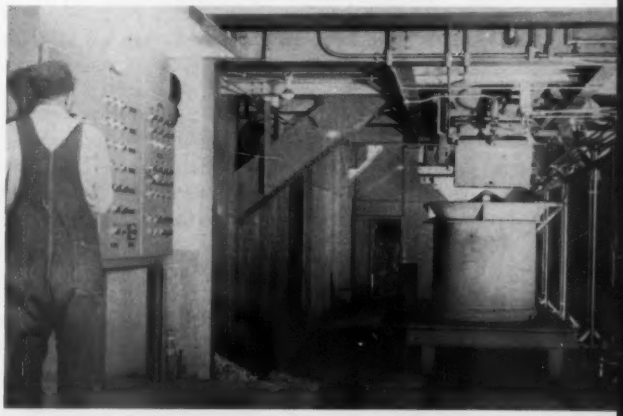
Cupola air is brought from outside at 7000 cfm into a unit which withdraws or adds water to maintain a level of 3.2 grains per cubic foot. Temperature of the air is raised to 600° F in a gas-fired heater and piped to the cupolas.

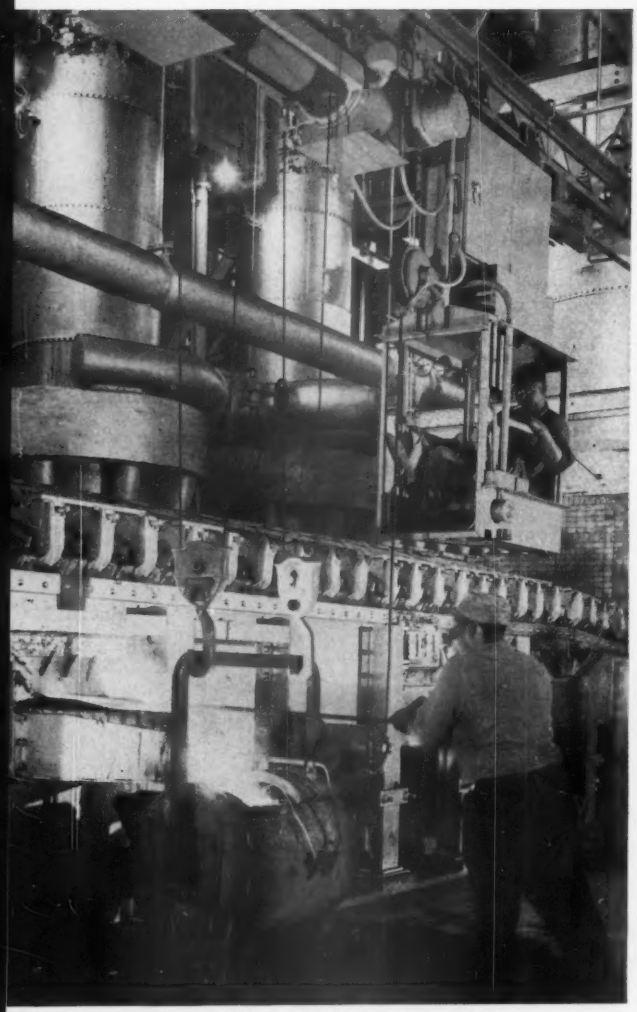
Air Furnace Operation—Iron from each of the cupolas can be tapped into either of two air furnaces through a system of refractory-lined troughs. The air furnaces are 30-ton batch units which refine and superheat the iron to 2900° F. They are fired with powdered coal. Supply air is preheated to 275° F by drawing it through hollow blocks lining exhaust stacks of the furnaces.

The analysis of air furnace metal is 2.40 C, 1.10 Si, 0.42 Mn, 0.12 S, and 0.06 P. Carbon analyses are made every half hour; tests for manganese are made every hour, and all elements are checked three times daily. A fracture test is performed every hour on a white iron test plug, and one casting from each annealed stack is checked for proper anneal. Separately cast test bars are annealed with the castings and checked for minimum physical properties of 54,000 psi tensile strength, 35,000 psi yield strength, and 18 per cent elongation.

Sand Conditioning — Two systems supply green

Electric car positions bucket under hoppers to receive metal, coke, and limestone charges





Cab-type, monorail ladle moves 1000-lb batches of iron from air furnaces to pouring areas

sand to four molding lines. Each system has two 2-ton capacity mullers each capable of preparing 40 tons of sand an hour. Mullers have equipment for automatic cycling, moisture control, and measurement of sand and additives. A 200-ton capacity storage hopper in each sand system receives shakeout sand which has been run over a magnetic separator and through a rotating screen. Additional storage hoppers for each sand system receive wood flour and bentonite through pneumatic delivery pipes from supply bins in the basement.

Sand mixes for light and medium castings consist of AFS 105 bank sand with southern bentonite and wood flour. Moisture content is 3.2 ±0.2 per cent; green compression strength 8½ psi; permeability 35; deformation 0.0175, and dry strength 70 psi. Sand mixes for heavy castings have AFS 72 combined lake and silica sand plus southern bentonite, wood flour, and seacoal. Moisture is 3.4 ±0.2 per cent; green compression strength 9.5 psi; permeability 95; deformation 0.018, and dry strength 90 psi. Sand tests are made every 45 minutes on alternate samples taken from the muller and from the last molder's bin in the molding lines.

Prepared sand from each system is delivered to molders' hoppers by elevator and overhead belts. Plows along the belts are cycled to be down for a length of time preset on a timer at each station. When hoppers are full, sand presses against a switch which actuates an air cylinder to keep the plow up. When the sand level falls, the plow lowers and stays down for its time cycle. After the last hopper in the line is cycled or when sand goes off the end of the belt, all other plows lower again for their cycle, unless held up by the overriding full hopper switch.

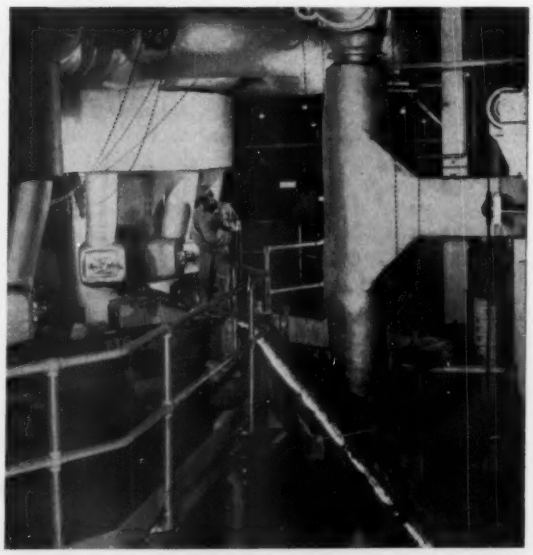
Green Sand Molding—Lines 1 and 2 each have 18 jolt-squeeze machines for matchplate work in snap flasks. Molds are set off on wooden bottom boards to 36 waist-high gravity roller conveyors 40 ft long. Some molds are weighted; others receive steel jackets and then are pushed to the last half of the conveyors for pouring from manually operated ladles suspended from bridge cranes.

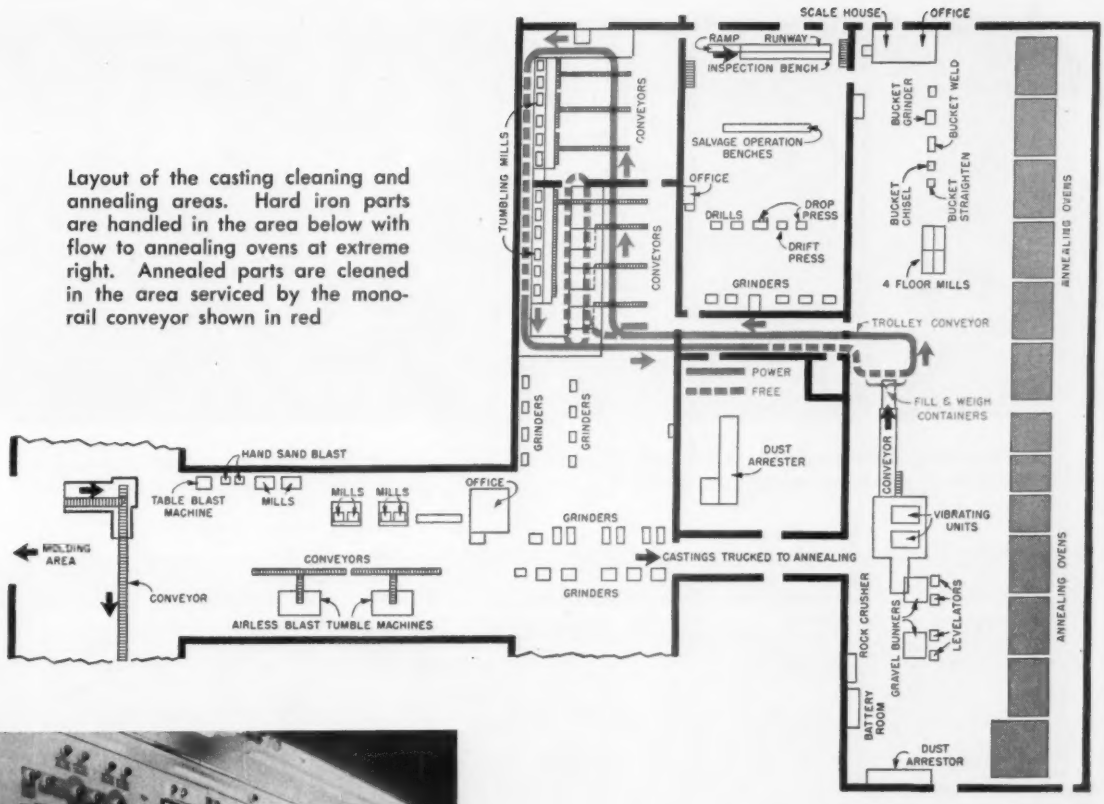
Cooled molds are dumped off ends of the conveyors to grids in a deck about 14 in. above floor. Castings which cannot be handled on a vibrating shakeout are hooked off the grids to the floor, desprued, and segregated into steel tote boxes for fork-trucking to the cleaning room. Gating metal, other castings, and sand are pushed through doors in the deck to an oscillating conveyor in the basement.

Shakeouts at the ends of these conveyors from Lines 1 and 2 discharge castings and gating metal to a common oscillating conveyor, which carries them to an apron conveyor along which despruing and segregation operations are performed.

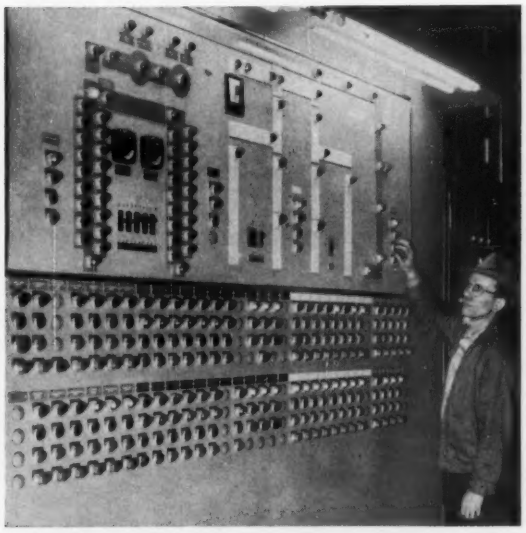
Molding Line 3 has two sets of cope and drag jolt-squeeze machines, four jolt-squeezers for matchplate work, and one jolt-squeeze rollover draw machine. An expansion area in this line provides for

Iron from either of two cupolas flows along an X-shaped trough to either of two air furnaces





Layout of the casting cleaning and annealing areas. Hard iron parts are handled in the area below with flow to annealing ovens at extreme right. Annealed parts are cleaned in the area serviced by the monorail conveyor shown in red



One of two central panels controlling the molding sand, dust collection, heating, and ventilation systems, and shakeout conveyors

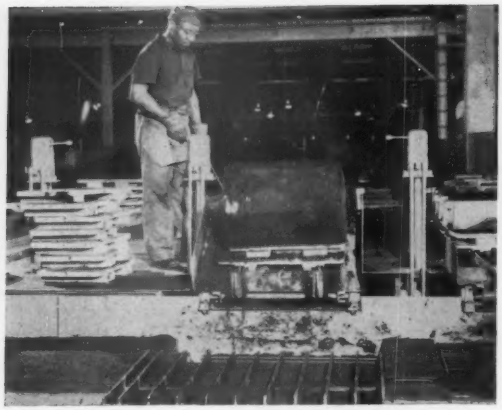
additional molding machines. Two sets of waist-high rails 40 ft long are located behind each machine. Molds are made on wooden bottom boards and set off on wheeled aluminum pallets which ride on the rails. Pouring is done along the last 20 ft of the rails with ladle equipment similar to that used on Lines 1 and 2.

Except for four sets of rails, molds are dumped automatically by releasing a hinged section of the rail conveyor. The wheeled pallet is retained on the hinged section, which pivots back to a lower set of rails on which the pallet returns by gravity to the molders. Hand-controlled, air cylinder-operated tilting sections on four sets of rails dump the larger molds made on the cope and drag machines. Handling of castings and gating metal is the same as on Lines 1 and 2.

Molds on Line 4 are made on 14 jolt-squeeze machines with matchplate patterns in snap flasks. Molds are set off on a car conveyor where other workers place steel jackets and weights on them. Operators pour molds with hand-operated, monorail-suspended ladles. Poured molds enter an exhaust tunnel and travel through a 180-degree turn to an open area where weights and jackets are removed. The mold-carrying conveyor then enters a cooling room where it doubles back and forth to allow 20 minutes cooling time before proceeding to the other end of the loop.

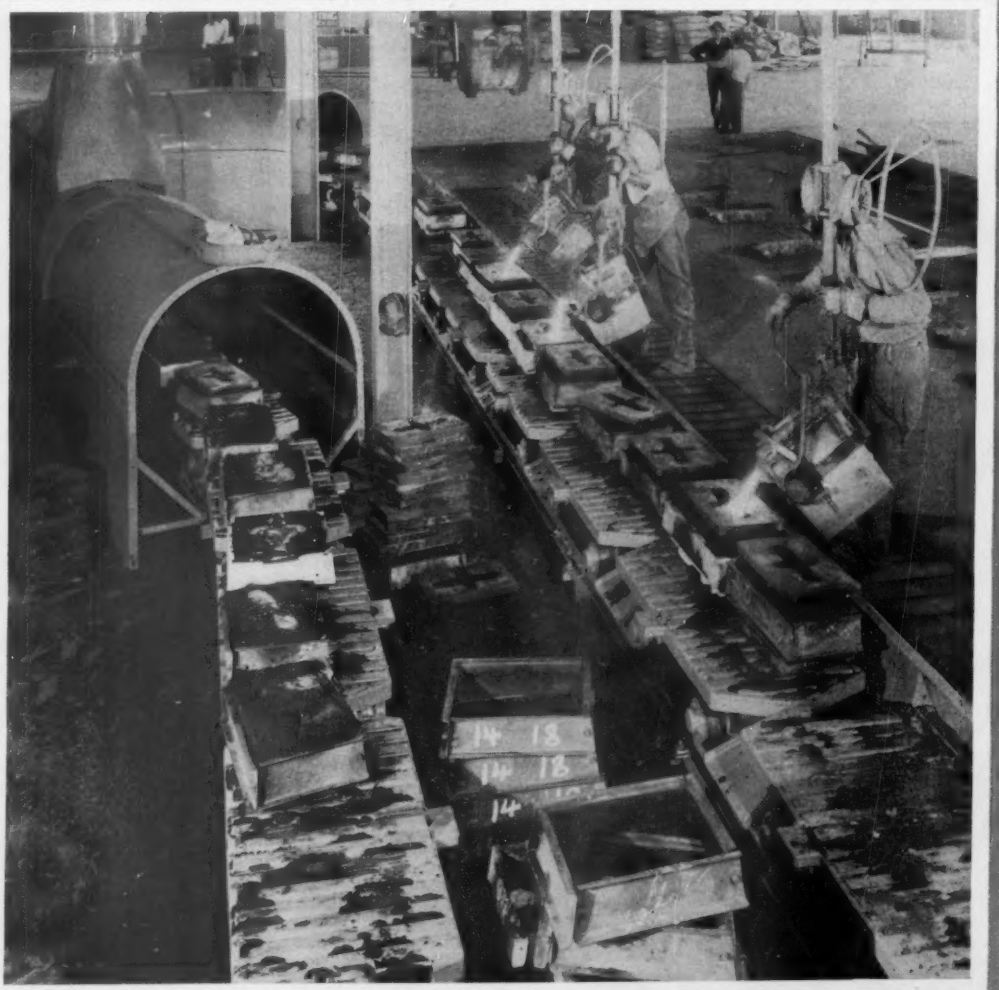
Here rollers on the sides of the hinged car tops ride up on a rail to tip the mold to a chute over a vibrating shakeout. Bottom boards are held on the car by lugs on the hinged side of the car top. Castings from the shakeout fall to the common oscillating conveyor, carrying castings from the first three lines. Shakeout and spill sand from these four lines is handled by a system of oscillating and belt conveyors and bucket elevators over magnetic separators and through a rotating screen to the storage bins over the mullers.

Shell Molding—Line 5 has two 4-station rotary shell molding machines and two 4-station rotary mold closing machines. Molds are set off to hanger shelves on an overhead chain conveyor. It loops around 180 degrees, and molds are poured from the

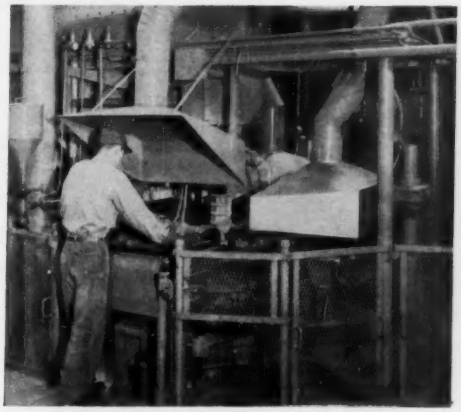


Air-powered device dumps pallet loads of molds to shakeout conveyor on Line 3

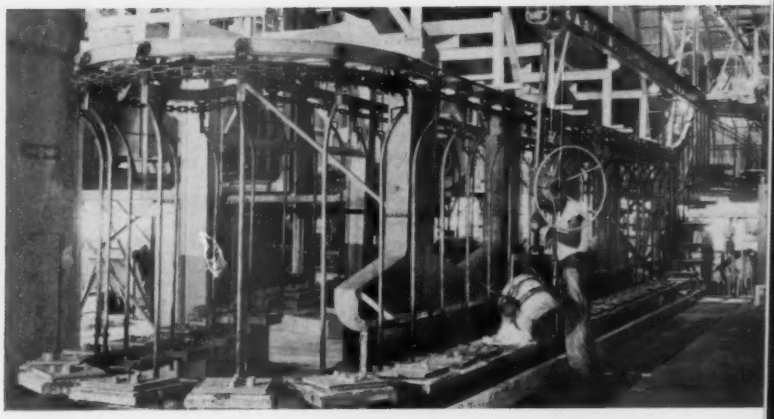
Molder sets cores in mold on Line 4. Finished molds are placed on conveyor cars



Workers pour molds from a moving platform synchronized with speed of the mold conveyor. Mold weight and jacket shifting zone is in foreground



Operator removes shell mold from one of two four-station molding machines



Pouring shell molds on shelves hung from overhead chain conveyor on Line 5. Shelves are tipped to remove poured molds

same platform serving Line 4. Then it climbs to near ceiling level and loops back and forth to provide cooling time before lowering to about 3 ft below floor level at a point halfway around the far end of the over-all loop. Here the hanger trips a lever which actuates an air cylinder device for tipping the shelf and dumping the mold to a vibrating shakeout. Castings fall to the oscillating conveyor handling castings from the other lines.

Loose sand which has most of the resin burned off falls through the shakeout and moves by oscillating conveyor and bucket elevator to a vibrating screen over an 8-ton storage bin. This sand is trucked from a gate under the bin to the shell-mold sand preparation area and dumped through a floor grating. New sand also is added to the system at this point and is raised by bucket elevator, screened, and plowed off a belt to an 80-ton capacity bin. Used sand flows off the end of the belt to a 20-ton capacity bin.

Powdered resin received in drums is dumped through a floor opening to a conveyor consisting of a chain with flights attached which travels through a steel casing carrying the resin to an overhead storage hopper. From there, resin moves by vibrating feeder to a weigh hopper, then through a rotating vane feeder to the muller. The vane feeder acts as an air lock between the muller and the resin supply. Sand from the 20 and 80-ton storage bins passes through measuring hoppers to the muller.

The coated sand is discharged to a high-speed, cleated belt which raises it to a vibrating screen, breaking up lumps in the process, and down a chute to a screw conveyor about 8 ft above the floor. Hand gates deflect the sand to either of two hoppers supplying the two shell molding machines.

Coremaking—AFS 80 silica sand and AFS 65 lake sand is delivered to the foundry in boxcars and unloaded by front end loader to manhole openings outside the building. The sand falls to basement storage bins. Bucket elevators in each of the two bins raise sand to a batch hopper over the muller and are stopped automatically when the hopper is full. Western bentonite and cereal received in bags are transferred to drums alongside the muller.

Eight oil-sand mixes are prepared in 500-lb batches as needed. The muller discharges to the floor, and prepared sand is delivered by wheelbarrow to benches and blow machine hoppers. Nine coreblowers are located along one side of a slider belt, eleven benches along the other side. Operators set green cores off on metal plates to the belt, which carries them to a gas-fired tower oven operated at 480° F.

Operators unload baked cores to two parallel gravity roller conveyors. Definning work is done along one. Cores unloaded at the end of the other are placed in storage racks from where they are moved to benches for definning and inspection. All cores are loaded in boxes and stored on racks in a separate room ready for hand trucking to the molding areas.

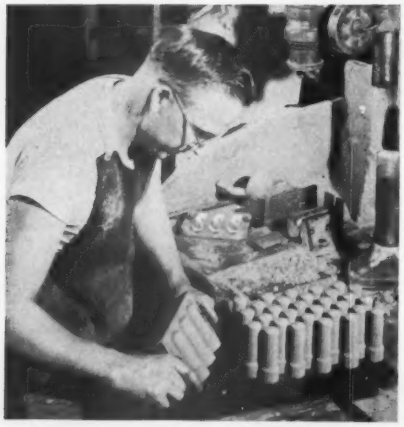
Sprueing and Sorting—The basement oscillating conveyor, carrying castings from the five molding lines, discharges to an inclined apron conveyor along which, at main floor level, operators desprue castings and segregate them to tote boxes. Gating metal is discharged off the end of the apron conveyor to a tumbling mill and is carried from it by an apron conveyor and an overhead belt conveyor which dumps it in the covered metal storage area.

Hard Casting Cleaning—Fork trucks will move most of the castings to either of two airless blast tumbling machines in the proposed new hard iron cleaning room. These will be loaded by skip hoist and will discharge onto oscillating conveyors where workers will sort and inspect castings for subsequent handling.

Other castings entering the cleaning room will go to two floor-level tumbling barrels, a blast table, or into four elevated tumbling barrels which discharge to tables for sorting. Trucks then move tote boxes of cleaned castings to grinders and then into the annealing room.

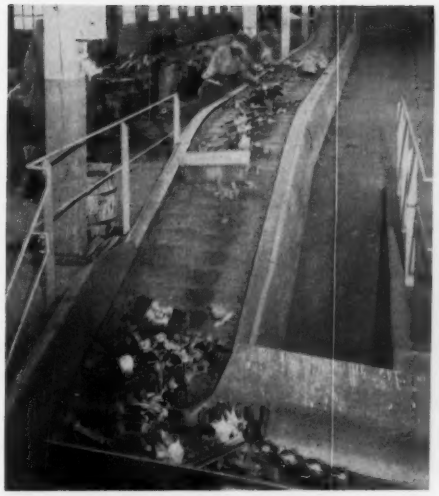
Annealing — Cleaned and ground castings are

Monorail metal carrier delivers iron to pouring ladles carried by bridge cranes traversing mold set-off area of Line 1



Cores produced on bench-type coreblower are set off on steel plates for baking

Coremaking machines are aligned along a slider belt conveyor which moves plates of cores to a tower oven for baking



Conveyor in foreground discharges castings from shakeout to apron conveyor for despruing, inspection, and sorting

Trucks move castings packed in alloy iron pots with red flint gravel into coal-fired annealing ovens. Packing prevents casting warpage during annealing

loaded into 20 x 30-in. cast alloy iron pots stacked four high on an iron stool. Boxes are placed on a hydraulic platform which lowers them so the top of the stack is at floor level. Red flint gravel is flowed into them from 6-in.-diam pipes attached by a swivel to supply hoppers. The stacks are raised, and fork trucks move them to the floor where joints between the pots are mudded and an iron plate mudded on the top.

Fork trucks load the stacks into any of 13 conventional batch-type annealing ovens. These powdered-coal-fired ovens are brought to the first-stage annealing temperature and held for the required length of time. The oven is then dropped to the second-stage graphitization temperature and held to complete the annealing process, after which the oven is opened and the pots removed to the annealing department floor for final cooling.

Cooled stacks are fork-trucked to a three-sided, hooded and exhausted enclosure and the bottom section grasped by air clamps. The truck removes the stool and the contents fall to a vibrating shakeout. An oscillating conveyor carries the packing gravel to a bucket elevator which empties to a distribution belt over two hoppers, supplying the stack-feeding pipes.

To produce pearlitic malleable iron castings, completely annealed castings are subjected to an additional heat treatment to recombine the desired amount of carbon to produce any of the standard ranges of pearlitic iron.

Cleaning After Annealing—Castings slide off the shakeout to an inclined apron conveyor which serves as a feeder for 300-lb capacity buckets on a trolley conveyor. A scale-mounted section of overhead conveyor supports the buckets in loading position so that loads may be weighed.

Buckets on the overhead castings conveyor are suspended from free-rolling trolleys propelled along an overhead monorail by dogs on a chain conveyor. Switches permit the trolleys to be pushed to sections of monorail where they cannot be engaged by the power chain. Such areas allow overhead castings storage and loading, weighing, and unloading operations. Tilting buckets on the trolley hangers permit emptying castings into airless blast machines or tumbling barrels. These machines empty to benches where castings are sorted into boxes and rolled out on gravity conveyors for temporary storage. Fork trucks carry them away for finish grinding and inspection, then to the shipping or stores departments.

Dust Control and Ventilation—Air in the foundry is changed every four minutes by 15 ceiling fans and localized exhaust systems attached to dust collectors. Ten fresh air inlets also have heaters which temper the air during winter months. The air will be tempered with steam from a waste heat boiler, using the air furnace flue gas. These air tempering units will be used as space unit heaters, thermostatically controlled, served by steam from the plant power house when the foundry is not operating.

Three 40,000-cfm wet collectors handle dust-laden air from mold dump stations on Lines 1, 2, and 3. Two 32,000-cfm wet collectors serve the molding sand preparation areas, shakeout screens, and the sand return system. Each cupola stack has its own wet collector system.

Conveyor tunnels in the basement are exhausted to the atmosphere by two 18,000-cfm units. Exhaust units also are mounted in the mold-cooling tunnel and cooling room on Line 4.

Slurry from the wet collectors is carried in underground pipes by gravity to an outside settling tank. Water ultimately is piped to the city sewer system. A drag chain removes sludge, which is hauled to a dump.

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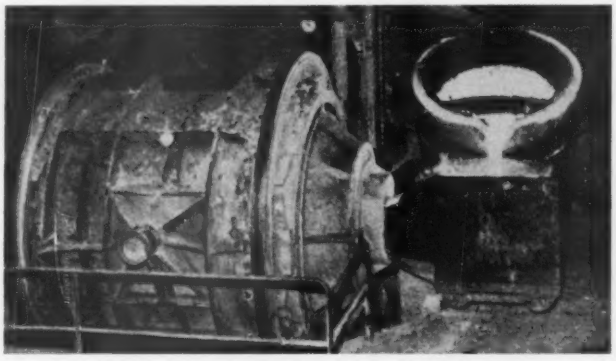


Fig. 1—In Kalling desulfurization method, iron is poured into a ladle, then into cylindrical rotary drum which contains coke breeze, and lime is added

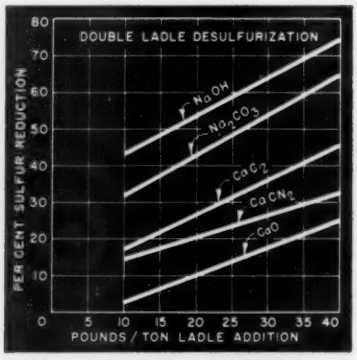


Fig. 2—Results of laboratory desulfurization tests in which lime was added to iron entering ladle

DESULFURIZATION OF IRON and STEEL

Lowered sulfur contents in iron and steel improve metal properties and castability and reduce costs. This article describes various desulfurizing methods and agents and the results obtained with them

By S. L. GERTSMAN

Chief, Physical Metallurgy Div.
Mines Branch, Dept. of Mines & Technical Surveys
Ottawa, Ont., Canada

WHAT is the purpose of desulfurizing iron and steel? Considering gray iron first, some of the reasons are:

1. More scrap iron may be used in the cupola if the sulfur is reduced.

2. There is less danger of producing iron with an improper manganese-to-sulfur ratio.

3. If the sulfur is maintained at a lower level, less manganese can be used.

4. It is necessary at times to meet a maximum sulfur specification.

In the production of nodular iron a saving in nodularizing agent is achieved if sulfur content of the base iron is low.

For steel there are a number of reasons for wanting reduced sulfur contents. To name a few:

1. In wrought steel, high sulfur lowers transverse ductility and may result in hot shortness. Conditioning costs are reduced when sulfur contents are kept to a low level.

2. In the steel castings industry, difficulties due to grain boundary sulfides are reduced when sulfur is low. Hot tearing characteristics of cast steels are also associated with sulfur content. High sulfur appears to increase the tendency toward hot tearing. To obtain good low-temperature impact properties on low alloy steels, low-sulfur contents are most desirable.

Iron is easier to desulfurize than steel. It is easier because 1) the property known as the activity coefficient of sulfur in the melt increases with higher carbon and silicon contents, and 2) the higher the activity coefficient, the easier it is to eliminate the sulfur. This explains why ladle desulfurization or quick desulfurization has been practiced for a number of years on cupola metal with its relatively high

Fig. 3—Batch feeder used to inject calcium carbide into metal to desulfurize

carbon and silicon contents, whereas it has not been carried out successfully with steel until recent years.

Good Contact Necessary—To desulfurize a bath of iron with a desulfurizing agent necessitates good contact between the iron and the agent. This intimate contact, however, is not readily achieved between the reducing desulfurizing slag and the steel in a basic electric direct-arc furnace. Contact between the surface of the metal and the bottom surface of the slag is good, but metal at the bottom of the furnace does not come into contact readily with the reacting slag. The sulfides have to come up by diffusion, which accounts for the relatively long period required for desulfurization.

Some steel foundries try poling to stir the slag into the metal and achieve contact. Another method is by means of an induction stirrer attached to the bottom of the electric furnace. It causes bottom layers of metal to be brought into contact with the slag, and the desulfurization reaction is speeded up. It is claimed that desulfurizing time can be cut from 1½ hours to 25 minutes by use of this device.

Fig. 1 shows Kalling's procedure for desulfurizing iron and the method of obtaining intimate contact. The writer saw this process used at Spannarhytten in Sweden. It consists of pouring the iron (from a blast furnace) into a ladle, then into the cylindrical rotary drum, which contains coke. Dehydrated lime is added and the drum is rotated in one direction for 20 minutes at about 40 rpm. The quantity of lime used is 10 to 15 times the sulfur content. The coke, in the form of breeze, is one-third of the lime content. If the sulfur is 0.10 per cent, then the lime is 1-1½ per cent and the coke used is 0.33-0.50 per cent.

A reduction of sulfur from 0.10 to about 0.020 per cent or less is achieved, roughly an 80 per cent reduction. Incidentally, the lime is doing all the desulfurizing, while the coke takes care of any oxygen in the vessel. To give some idea of the effect Kalling achieves in his process, Fig. 2 presents results of some desulfurization tests carried out in our laboratory. Lime was added to the stream of iron entering the ladle (bottom curve). An addition of 1 per cent lime reduced the sulfur content only about 10 per cent, whereas 2 per cent lime reduced it by 25 per cent. This is in contrast to an 80 per cent sulfur reduction obtained by Kalling using coke and a good mixing practice.

Fig. 3 shows the Airco batch feeder used for injecting calcium carbide as a desulfurization agent into the metal. Calcium carbide is placed in the hopper and a gas, such as nitrogen, is started through the system. The lance is lowered slowly into the metal. The carbide control valve is opened and fine particles of calcium carbide are sprayed into the metal. The gas which carries the carbide agitates the metal. Thus the desulfurizer and the metal are in very good contact with each other and excellent desulfurization results. By this method a sulfur content of 0.07 to 0.12 per cent can be reduced to about 0.010 per cent. The application of such a feeding device to the desulfurization of steel is discussed later in the paper.

In ladle desulfurizing, erratic results can occur, if furnace slag is carried into the ladle. Some plants build a silica refractory dam on the pouring spout. Fig. 4 illustrates such a dam. A small hole at the bottom of the wall allows the metal to go through, and an opening on the side of the spout allows the slag to be run off. Another method, used in desulfurizing steel, is to build up a wall at the inside of the pouring door of the furnace. Using 1½-in.-diam lumps of lime, the wall blocks about two-thirds of the door height. On tilting the furnace, the metal goes under the lime but furnace slag is held back.

Various Agents Used—A number of desulfurizing agents have been used for iron. Some time ago a controlled program was initiated at the Mines Branch whereby these agents were used under similar conditions to determine, first, their relative efficiency, and second, the best method of adding them to the metal. Fig. 2 shows the results obtained in one part of this project. The reagents used were lime, calcium cyanamide, calcium carbide, soda ash, and sodium hydroxide. Some 450 lb of electric furnace iron of approximately the following composition were treated: C 3.50, Mn 0.50, Si 2.00, S 0.10, P 0.0050.

The desulfurizing agent was added to the stream of metal at it entered the ladle. Bags containing ½ lb of the agent were thrown into the stream at regular intervals throughout the pour. Immediately

TABLE I—Blank Test Using Lime

(30 lb per ton)

Keel Block	Time Min: Sec	Sulfur Content Per Cent	Temperature °C
AF—furnace	00:55	0.049	1650
B—ladle stirred	02:15	0.046	1652
BF—furnace	02:50	0.049	
C—ladle not stirred	04:00	0.046	1638
CF—furnace	04:40	0.049	
D—ladle stirred	05:50	0.048	1630
DF—furnace	06:20	0.049	
E—ladle not stirred	07:30	0.047	1638
EF—furnace	07:50	0.049	
F—ladle stirred	09:00	0.047	1600
FF—furnace	09:25	0.049	

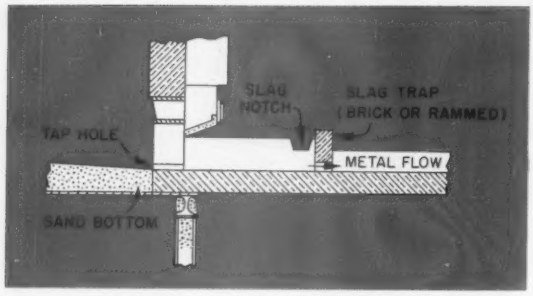


Fig. 4—Silica refractory dam built on furnace pouring spout to hold back the furnace slag

after the pour, the ladle of metal and slag was stirred vigorously until the main reaction had subsided. The ladle was held for three minutes, then poured into a second ladle. The results shown in the chart were obtained by taking the initial sulfur content of the metal just before pouring and the final sulfur content from a sample taken from the second ladle. It should be pointed out that after stirring the metal in the first ladle and holding it there for three minutes, no further desulfurization resulted from the second pouring operation.

All of the tests were carried out at a pouring temperature of 2750° F (approximate). The results show sodium hydroxide and sodium carbonate as rather similar in efficiency. The other reagents were less efficient. It should be emphasized that these results relate strictly to the one set of conditions imposed in this series of experiments. Other methods of addition and larger volumes of metal, for example, might change the relative efficiency of the desulfurizing agent.

Two sets of curves are shown for calcium cyanamide in Fig. 5. The top curve gives the results of test carried out with all of the calcium cyanamide placed in the bottom of the ladle before pouring the metal into it. This is a more efficient method than throwing the calcium cyanamide into the stream. Incidentally, this reagent increased the nitrogen content of the iron from 0.019 to 0.030 per cent when it was all added at the bottom of the ladle and from 0.014 to 0.022 per cent when it was added to the stream. Since nitrogen can alter the properties of the iron, this factor has to be considered when using calcium cyanamide as a desulfurizing agent.

Desulfurization of Steel—The remainder of this paper deals with work at the Physical Metallurgy Division of the Mines Branch on the desulfurization of steel using magnesium alloys. The first part of this project was carried out with the Steel Castings Institute of Canada, which was interested in desulfurizing acid electric steel. After the work on nodular iron, it was known that magnesium alloys went into iron without too much danger. There was some concern, however, as to the possible violence on adding magnesium to steel.

At first, small pieces of magnesium were thrown on top of steel while it was still in the small 50-lb basic induction furnace. All that happened was that the magnesium bounced back out of the melt. When a larger piece was thrown, a minor explosion occurred. Pure magnesium, 50/50 magnesium silicon, and 50/50 copper magnesium were tried in this way but with little success; in fact, there was no sulfur reduction.

About this time an attempt was made to plunge a piece of magnesium into a small ladle of steel. A plunging cup was prepared with a number of perforated holes. Pure magnesium (99 per cent) was placed in the cup, which was welded to a long steel rod. The cup was plunged below the surface of the metal, the long rod permitting the operator to be at a safe distance. A tremendous burst occurred and the remaining metal froze. Analyses for sulfur before and after the plunging showed that no reduction was obtained.

The first relatively quiet method found to introduce magnesium into the melt was in the form of an extruded wire 1/8, 3/16, or 1/4 in. in diameter. Fig. 6 shows the arrangement. The wire was fed through a lime cover into the steel at a controlled rate. A hand-operated clothes-wringer was used as a controlled feeding device. One end of the magnesium wire was placed between the two rubber rolls. The other end was led into a 3/4-in. gas pipe, approximately 20 ft long, bent in such a way that the magnesium wire was directed vertically downward into the melt. A conical-shaped funnel mounted at the end of the pipe acted as a hood over the furnace to catch any sparks or spatter of metal.

While working with this method, it was decided to try to insert a 3/4-in.-diam magnesium rod 1 in. long into the steel. A hole was drilled into the magnesium and it was attached to a thin steel wire and then immersed in the steel, using the same mechanism as above. To everyone's surprise the magnesium went through the lime cover and into the metal very quietly.

A 1-in.-diam rod was then tried. Eight inches of this thick rod was attached to the steel wire. No lime cover was used on the melt and when the rod was fed into the open melt of steel a tremendous display of fireworks resulted. The test was stopped to prevent a possible fire in the foundry.

Alloy-Slag Method—The crushed alloy-slag meth-

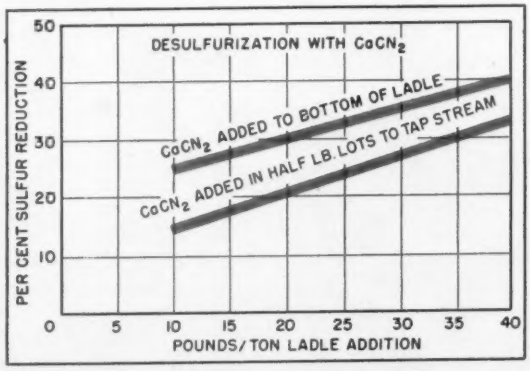


Fig. 5—Chart shows comparison of two methods of adding calcium cyanamide to gray iron

od was then tried. Granulated magnesium or magnesium alloys were intimately mixed with dried lime, and sometimes fluidizing agents, such as sodium carbonate, fluorspar, and borax, were added as well. This mixture was thrown into the bottom of the ladle and molten steel was poured onto it. Fig. 7 shows the quiet reaction obtained.

Since lime was the slag constituent in the majority of tests, a series of blanks was run using lime by itself without the alloy. Table I shows the effect on desulfurization of pouring steel into a ladle containing 30 lb per ton of dried lime. The slag and metal in the ladle sometimes were stirred and at other times were not stirred. The temperature also was varied from roughly 2900 to 3000° F (1593 to 1649° C). With lime, by itself, no significant sulfur reduction was obtained.

At first, commercially pure magnesium turnings were used in combination with lime for the actual desulfurization tests. Although a decrease in sulfur was obtained, it was decided that a more friable, less dangerous alloy would be desirable. After several tests with aluminum-magnesium series alloys, the 50 per cent aluminum 50 per cent magnesium alloy was adopted for more intensive testing. The alloy was used with lime alone or with a fluidizing agent, and the mixture was thrown into the stream. Table II illustrates some of the results. They indicate that desulfurization can be obtained with basic induction steel by this method. The sulfur can be reduced by 0.010 to 0.015 per cent, apparently, regardless of whether the initial sulfur content is 0.030 or 0.50 per cent.

Acid Electric Steel—It was felt that the process also should be tried on acid electric steel, which is more difficult to desulfurize than basic induction

Fig. 6—Quiet method of introducing magnesium in form of an extruded wire into a steel melt

TABLE II—Desulfurization with Aluminum-Magnesium Alloy

Heat	Slag—Lb Per Ton				Alloy		Per Cent Sulfur	
Number	Lime	Soda	Spar	Borax	Lb per Ton	Mesh Size	Initial	Final
				LIME WITH ALLOY*				
1184	40	...	...	...	4	−28	0.032	0.020
1216	40	...	...	...	2	−28	0.051	0.039
1184	40	...	...	...	2	−28	0.032	0.021
1184	40	...	...	...	1	−28	0.032	0.021
1186	30	...	...	...	4	−28	0.029	0.017
1215	30	...	...	...	2	−28	0.049	0.038
1186	30	...	...	...	1	−28	0.029	0.022
				LIME—SODA ALLOY*				
1184	40	1	...	...	4	−28	0.029	0.015
1184	40	1	...	...	1	−28	0.029	0.019
1207	30	1	...	...	4	−28	0.030	0.018
1186	30	1	...	...	1	−28	0.029	0.019
1177	30	1	...	...	1	−28	0.050	0.036
1266	20	1	...	...	4	−28	0.028	0.021
1266	20	1	...	...	2	−28	0.028	0.021
1177	20	1	...	...	1	−28	0.050	0.035
				FLUID SLAG—ALLOY*				
1263	20	...	4½	1½	10	−28	0.037	0.026
1223	20	...	4½	1½	6	−28	0.068	0.052
1222	20	...	4½	1½	4	−28	0.060	0.047
1220	20	...	4½	1½	2	−28	0.057	0.044
1223	20	...	4½	1½	1	−28	0.068	0.052
				EFFECT OF PARTICLE SIZE*				
1225	30	...	4½	1½	2	−12	0.055	0.042
1225	30	...	4½	1½	2	−6	0.055	0.043
1227	30	...	4½	1½	3	−4	0.051	0.040
1227	30	...	4½	1½	2	−4	0.049	0.037
1224	20	...	4½	1½	2	−12	0.050	0.037
1224	20	...	4½	1½	2	−6	0.049	0.036
1258	20	...	4½	1½	2	−6) +60)	0.032	0.021
				EFFECT OF TEMPERATURE (Heat No. 1236)				
Temp					2	− 6	0.041	0.032
1650° C	20	...	4½	1½	2	− 6	0.040	0.027
1570	20	...	4½	1½				

*Pouring temperature 1650° C (3002° F)

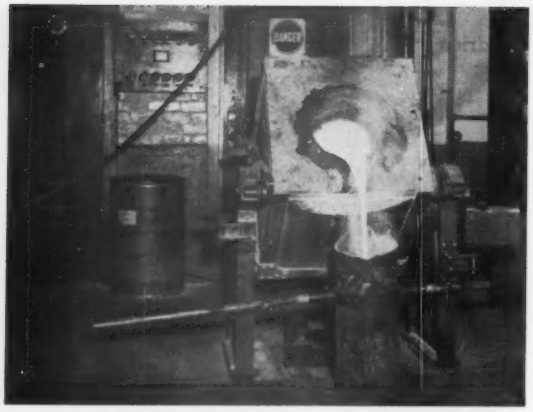


Fig. 7—Pouring steel into a ladle containing desulfurizing crushed alloy-slag mixture

steel. Not having a direct arc melting unit at that time in Ottawa, tests were made at Wm. Kennedy & Sons Ltd., Owen Sound, and Canada Car & Foundry Ltd., Montreal. These trials proved that acid electric steel acts differently than basic steel. The best reduction obtained of about 0.007 per cent was on only one heat. It was realized that three requirements were necessary: First, the acid slag must be removed completely from the furnace before the metal is poured. Second, the metal must be in a well-deoxidized state. Third, a better method had to be used to bring the aluminum-magnesium slag mixture in more intimate contact with the metal that was being treated.

Some time later, engineers from Canadian Liquid Air Co. visited the Physical Metallurgy laboratories for some nodular iron trials. They used a gas injection unit somewhat similar to the Airco type. Two lance designs were employed. Fig. 8 illustrates the boot type lance and Fig. 9 the vertical type. This apparatus was used for a series of tests on the desulfurization of steel.

A peculiarity, apparently unique in connection with the tests, was the fact that frequently when a new technique was tried it worked well the first time, but sometimes it was difficult to reproduce the results. When basic induction metal was used, however, good desulfurization was obtained for well over 80 per cent of the tests.

Lance Tests—The first lance test was handled as follows. A 450-lb heat of induction-melted mild steel was deoxidized with 2½ lb of aluminum per ton. The slag mixture consisted of 15 lb of lime per ton and 3 lb of 50/50 aluminum-magnesium (−10 mesh) alloy per ton. There were 10 lb of lime in the ladle. It took 2 minutes, 5 seconds for the lancing operation, using 10 cu ft of argon gas. In the first series of tests, argon was used exclusively as the carrier gas. The operation effected a reduction from initial sulfur content of 0.035 per cent to final sulfur of 0.011 per cent. This result was encouraging, the drop of 0.025 per cent representing a desulfurization efficiency of about 70 per cent.

An acid electric heat was then tried. By this time the laboratories had a direct-arc unit and heats of 500 lb in size could be produced. The melt was slagged off in the furnace prior to pouring. It was killed with 2½ lb of aluminum per ton thrown into the stream. All other conditions duplicated those used with the basic induction heat. After injecting about 60 per cent of the desulfurizing mixture, the lance plugged so that all of the mixture could not be put through. Nevertheless, a drop from 0.045 per cent initial sulfur to 0.025 per cent final sulfur was obtained. Again, this looked encouraging. It should be mentioned that the metal cooled by about 100° F during these two tests.

Blank heats were carried out using 3 to 6 lb of aluminum-magnesium alloy per ton without lime and then 15 to 18 lb per ton of lime without the alloy. The average results showed a drop of 0.005 per cent sulfur when no lime was used and 0.008 per cent when the alloy was omitted.

Table III shows the results obtained using the boot type lance in the ladle for both basic induction and acid electric steel. Sulfur content in all these tests was approximately 0.055 per cent before treatment. Where the sulfur drop is shown as being greater than 0.020 per cent, this means that the sulfur content of the metal after treatment was 0.035 per cent or less.

The basic induction tests consisted of six heats in all. In four heats, the sulfur drop was greater than 0.010 per cent; in two, the drop was more than 0.020 per cent.

Of 14 acid electric heats treated in this way, 10 heats showed sulfur drops greater than 0.006 per cent. Three of the ten showed drops of more than 0.020 per cent.

Vertical Lance Used Exclusively—Table IV shows the results obtained with the vertical lance, which is now being used exclusively. It can be observed that, for the basic induction steel, more than 0.010 per cent reduction in sulfur was obtained for all of the 15 heats made and 9 of the 15 heats gave more than 0.020 per cent reduction.

Twenty acid heats were tried. All of them gave over 0.005 per cent, 12 of the heats more than

TABLE III—Ladle Lanced (Boot Type)

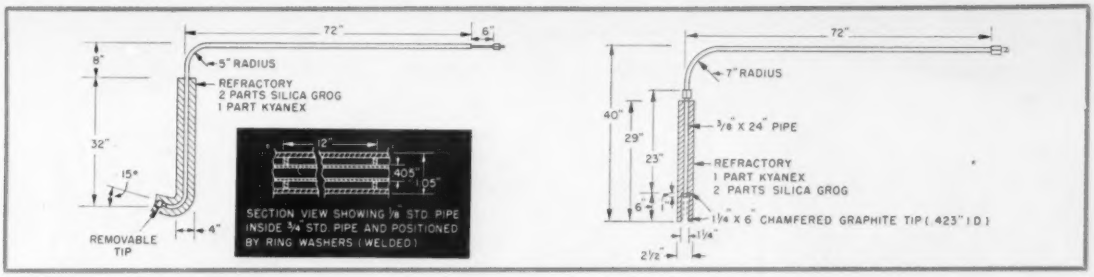
Sulfur Drop Per Cent	— Number of Heats — Basic Induction	Acid Electric
>.020	2	3
>.010	4	5
>.006	6	10
<.006	0	4
Total number of Heats tested	6	14

TABLE IV—Ladle Lanced (Vertical Type)

Sulfur Drop Per Cent	— Number of Heats — Basic Induction	Acid Electric
>.020	0	3
>.010	15	12
>.005	0	20
Total number of Heats tested	15	20

TABLE V—Acid Steel Furnace Lanced

Sulfur Drop Per Cent	— Number of Heats — Before Boil	After Boil
>.020	0	0
>.010	4	2
>.006	7	6
<.006	3	1
Total number of Heats tested	10	7



Gas injection unit was used for a series of tests on the desulfurization of steel. Fig. 8 (left)—Boot-type lance. Fig. 9 (right)—Vertical-type lance

0.010 per cent, and 3 of them gave more than 0.020 per cent sulfur reduction.

Fig. 10 illustrates a furnace lancing operation. The lance is held at a slight angle. The bottom of the lance is under the metal but not touching the furnace bottom. During treatment, the lance is moved continually around in the metal.

Table V shows some of the results obtained with lancing in the direct-arc furnace. Lancing was carried out before boiling the steel, since it was felt that an attempt should be made to use nitrogen instead of the more expensive argon gas. It was thought that by lancing before the boil, the subsequent boil would remove the nitrogen which had been introduced into the melt. The procedure was to melt down, slag off, deoxidize, lance, remove the basic slag, put on an acid slag, boil, and finish the heat. The results in the acid furnace were not too good. Seven of the ten heats gave more than 0.006 per cent sulfur drop and four better than 0.010 per cent. No drop was in the 0.020 per cent category in any of these lancing tests carried out in the acid-lined furnace.

Seven heats were lanced after the boil. The slag was removed, the metal deoxidized and then lanced. Six heats again gave more than 0.006 per cent sulfur drop and two heats more than 0.010 per cent.

Ten heats were desulfurized in the basic electric furnace by lancing after the boil. These heats were initially at the 0.030 per cent sulfur level. Seven of them ended at less than 0.010 per cent and the other three were slightly over this figure. It is felt that this method is worthy of trial in large basic electric heats for the production of low-sulfur steel. The operation can be accomplished in a relatively short time compared with using two or more reducing slags.

Furnace Lancing Easier—Incidentally, lancing in the furnace proved to be a smoother operation than lancing in the ladle. In the latter case, the hopper with the slag charge was on the mezzanine floor about 15 feet above the lance tip; otherwise, the lance would plug. In furnace lancing, the hopper could be on the same floor as the furnace. The experiments revealed a number of difficulties with the lancing operation, mainly mechanical ones. The boot lance gave most trouble with plugging, the vertical lance being much better in this respect. All recent experiments have been carried out with the vertical lance. The lime had to be granular; powdered lime resulted in plugging. If the aluminum-magnesium mixture was too rich, i.e. 10 lb of aluminum-magnesium alloy to 12 lb of lime per ton of steel, plugging would occur due to the premature fusing of the alloy.

In summary, more than 85 heats of acid and basic electric and basic induction steel have been desulfurized by lancing with a carrier gas. The results indicate that reductions of up to 40 per cent of the steel's original sulfur content can be obtained by lancing basic induction and acid electric steel in the ladle. This operation takes about 2 minutes for a 500-lb melt and is accompanied by a considerable drop in temperature (75 to 150° F). Lancing tests in the acid electric furnace, using an initial sulfur content of 0.055 per cent, gave reductions of about 0.008 per cent sulfur.

Using this technique, basic electric steel can be successfully lanced in the furnace to produce low sulfur contents in a relatively short period of time. Use of the lance in the arc furnace has been very satisfactory.

After some early mechanical difficulty, it was found possible to lance steel in the ladle. The biggest problem was the drop of temperature in the ladle—since small quantities of steel were treated.

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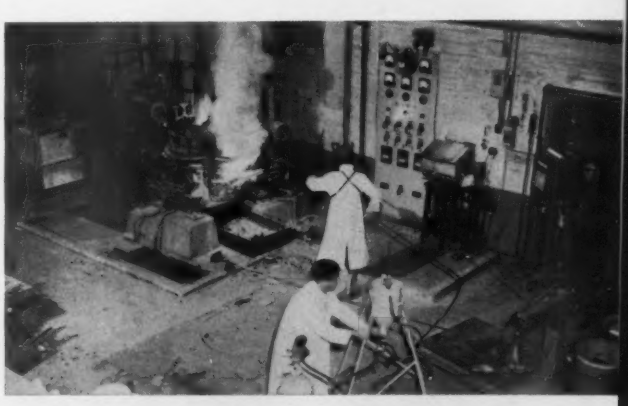
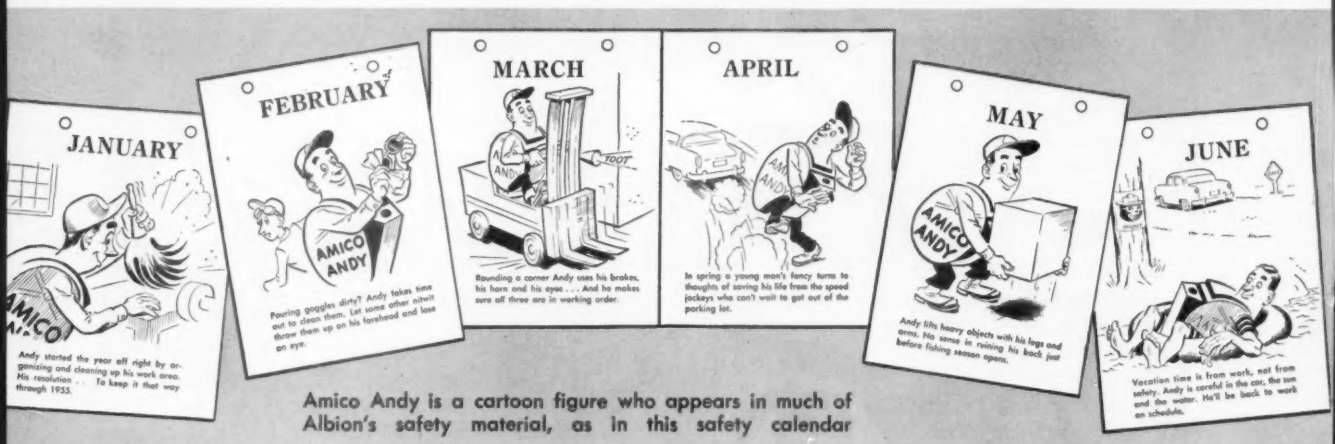


Fig. 10—Furnace lancing operation. Lance is moved around in the metal continually during treatment


JANUARY
Andy started the year off right by organizing and cleaning up his work area. His resolution . . . To keep it that way through 1955.
FEBRUARY
AMICO ANDY
Pouring goggles dirty? Andy takes time out to clean them. Let some other nitwit throw them up on his forehead and lose an eye.
MARCH
TOOT
Rounding a corner Andy uses his brakes, his horn and his eyes . . . And he makes sure all three are in working order.
APRIL
In spring a young man's fancy turns to thoughts of saving his life from the speed jockeys who can't wait to get out of the parking lot.
MAY
AMICO ANDY
Andy lifts heavy objects with his legs and arms. His sense in ruining his back just before fishing season opens.
JUNE
Vacation time is from work, not from safety. Andy is careful in the car, the sun and the water. He'll be back to work on schedule.

Amico Andy is a cartoon figure who appears in much of Albion's safety material, as in this safety calendar

SAFETY SAVES MONEY

Looking for ways to cut costs? Here's a possibility you may not have considered. At Albion Malleable, the safety program is saving tens of thousands of dollars per year in addition to averting injury and suffering

at Albion Malleable Iron Co.

By JACK C. MISKE
Associate Editor

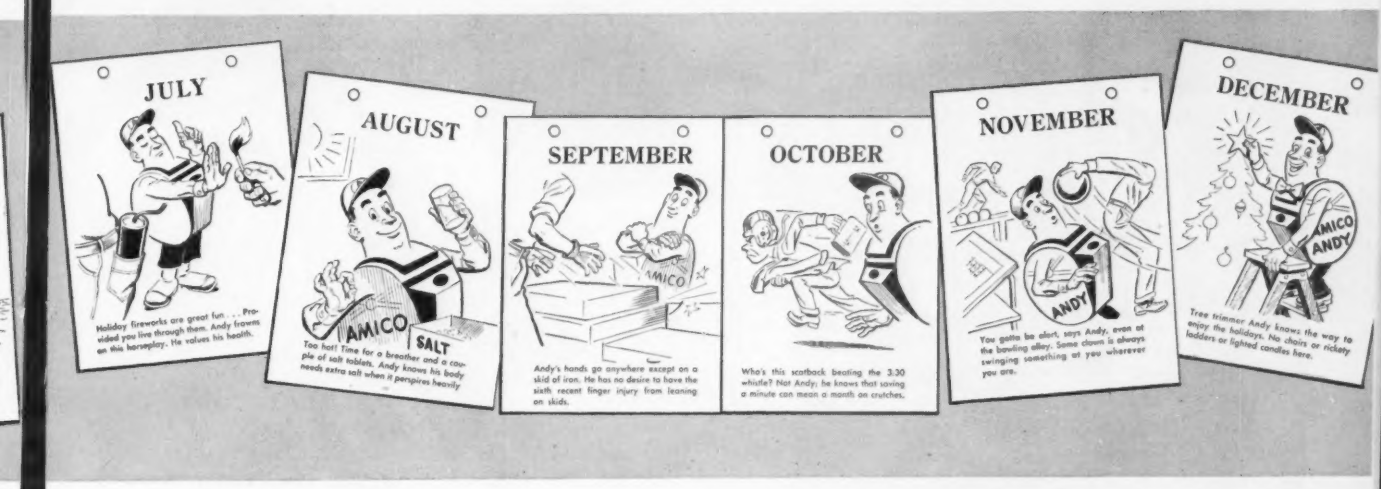
FOUNDRYMEN who think they've done about everything possible to cut costs might take a look at their companies' safety records. A poor one indicates one more area in which money can be saved.

These potential savings have a number of sources. They include reduction or even elimination of insurance premiums, less labor turnover, the ability to attract and hold better personnel, and the end of production slowdowns which inevitably occur following an accident and for some time thereafter.

Still another point, one which involves industry in general, is the rising cost of compensation for injured workers. Individual compensation payments will continue to increase, but savings can be made through reductions in the number of such increased payments. In addition, many states now are working on legislation as to what constitutes a safe plant. Unless industry cleans its own house, such legislation inevitably will raise the costs of operation.

It's clear, of course, that accident hazards are more implicit in the nature of foundry operations than in those of many other industries. Handling of molten metal, use of heavy equipment, and the need to move great quantities of material in production processes combine to create such hazards.

Working in this environment, however, foundries can accept accidents as part of the natural scheme of things, or they can cut the expenses they entail by intensifying their efforts to achieve safe operation. The fact that safe operation can be achieved has been demonstrated repeatedly by foundries of all sizes. The secret lies in individual company effort, aided by the activities of the various trade as-


JULY
Holiday fireworks are great fun . . . Provided you live through them. Andy frowns on this horseplay. He valves his health.
AUGUST
AMICO
SALT
Too hot! Time for a breather and a couple of salt tablets. Andy knows his body needs extra salt when it perspires heavily
SEPTEMBER
AMICO
Andy's hands go anywhere except on a skid of iron. He has no desire to have the sixth recent finger injury from leaning on skids.
OCTOBER
Who's this scatback beating the 3:30 whistle? Not Andy; he knows that saving a minute can mean a month on crutches.
NOVEMBER
ANDY
You gotta be alert, says Andy, even at the bowling alley. Some clown is always swinging something at you wherever you are.
DECEMBER
AMICO
ANDY
Tree trimmer Andy knows the way to enjoy the holidays. No chairs or rickety ladders or lighted candles here.

sociations, the National Safety Council, and the American Foundrymen's Society.

Let's take a look at what one particular foundry has done and at the results it has achieved.

Albion Malleable Iron Co., Albion, Mich., is a large, independent producer of malleable and pearlitic malleable castings. In normal times, it employs in the neighborhood of 850 persons. Ten years ago, it had no organized, directed safety program, and its safety record proved that it didn't. Not only were its insurance costs high, but in 1950 no insurance company in the country wanted to insure it. That reluctance was understandable in view of the company's record in 1949 of 63.6 lost-time injuries per 1 million manhours worked.

This situation and the human misery it generated were eloquent enough arguments for immediate action. In addition, however, Albion discovered that losses from production as a result of accidents sometimes were more expensive than medical and compensation costs. This sort of loss increases as a foundry moves to mechanization and automation, which tie production into an integrated flow. Albion management also feels that overemphasis on production can cause accidents which reduce production. Yet another factor that prompted the company to act on safety was the desire to cut labor turnover and to attract and keep good personnel. This point is important to Albion because it is situated in what normally is a tight labor market.

Immediate Success—Once the company turned to the goal of safe operation, it avoided halfway measures. The success of its program was apparent immediately. The accident frequency rate has fallen each year since 1950 with the exception of 1955, as Table I shows. In 1957, it hit an all-time low,

The company's safety department stocks more than 80 items of safety equipment, all provided free. Safety shoes also are stocked and are sold at cost

At Albion, wearing safety glasses is a condition of employment. Employee at left had his sight in each eye saved by them in one day, in separate accidents

1.793, or a 97.2 per cent reduction from the 63.6 recorded in 1949. The 1957 figure was so low that maintaining it is a real challenge. There has been an increase in 1958, to an estimated 4.0, but Albion is confident that it isn't going to permit complacency to destroy the gains it has made. They are too impressive, financially and otherwise, to let them slip away.

TABLE I—Safety Record, 1948-57

	FREQUENCY*	SEVERITY*
1948	56.71	3686
1949	63.6	3150
1950	40.4	5800
1951	20.5	1268
1952	15.28	678
1953	8.70	4932
1954	8.69	1048
1955	13.67	1221
1956	7.32	261
1957	1.79	183

*Per 1 million manhours.

Today, Albion is self-insured. When no insurance company in the country wanted its business in 1950, Albion went to Lloyds of London. In a couple of years, companies in the USA were trying to sell it insurance. Now its only policy is one, with Lloyds, against catastrophe—that is, a series of bad accidents. The foundry has collected on this policy only on unavoidable occupational illness cases and two highway accidents, something on which a newly instituted safety program can have little or no effect.

Self-insurance saved Albion more than $60,000 under the state's manual rate in 1957 alone, for example.

How It was Done—What did Albion do to reduce its accident frequency rate by 97.2 per cent in less than 10 years? It did a lot of things, and it was the sum total of them, all the result of a concerted management attack on unsafe operations, that got the job done. The ingredients include a watchful, imaginative safety department which sets up rules; a safety council of the plant's general foremen; availability of safety equipment and strict rules requiring its use; departmental safety rules; frequent meetings on safety; posters; literature which includes a weekly newsletter; a monthly "safetygram"; contests; and continual hammering at the subject in *The Circle-a-tor,* which is a magazine published by the foundry. Let's look at these activities in just a little more detail.

Safety Department—The important thing about a safety department is not that it be created, but that it be backed completely by management. Safety Supervisor Marvin B. Hoyt, who reports to A. C. Hensel, manager of personnel and public relations, gets that support at Albion. Without it, he and his co-workers could not have achieved the success they have. For example, the safety department has authority to act in a department if the foreman will not.

Safety Council—The company's safety council is composed of 11 general foremen. They meet regularly with the safety supervisor to discuss and coordinate accident prevention work. Each month, they also meet with a safety engineer from the company's insurance broker, who looks over operations and suggests whatever can be done to reduce hazards. A monthly "safetygram" is sent to all supervisors, to keep them abreast of the situation, and it is posted on all bulletin boards.

Both the plant and the individual departments

have safety rules. The company safety director explains plant rules as soon as an individual is hired, and the new employee must read them and sign that he understands them. This procedure is repeated in two weeks. New employees are let go before the end of a 60-day probationary period if they will not comply with the rules regarding safety equipment and conduct. As a condition of employment, they are required to wear safety shoes and glasses at all times in working areas.

Glasses in a variety of sizes and types are stocked by the company and are supplied free. They have saved many eyes at Albion, as one of the accompanying illustrations shows. A total of 27 glasses cleaning stations, at which cleaning compound and tissues are available, are maintained in low-danger areas, where glasses can be removed and cleaned with relative safety. The company also stocks safety shoes and sells them to employees at cost. All other equipment, as required, is supplied by the company. Another of the accompanying illustrations shows the diversity of equipment available.

The foreman of the department in which the employee works also explains that department's rules to him and has him read them. Departmental safety boards show how many days have passed since the last lost-time injury in each department.

Contests Help—Quarterly contests offer employees additional incentives to work safely. The name of each man who worked in a section where no lost-time injuries were incurred is placed in a barrel, by sections, and a single card is drawn per section. Prizes range from outboard motors to vacuum cleaners (to get employees' wives into the act). When all departments are without lost-time injuries, special additional prizes are awarded.

Another contest, designed to reach into the employee's home, is aimed at safety as one aspect of a good relationship between employer and workers. It involves a Christmas-Safety coloring contest, with $100 in prizes, for employees' children, who compete in two age groups, those up to 8 and those from 9 to 12. They color drawings related to safety. This sort of promotion bolsters safety consciousness at the same time that it cements company-employee relationships. First-prize entries in each class are published in *The Circle-a-tor* in color, one on the front cover, the other on the back.

Full-time Safety Taught—It's part of Albion's safety program to work for safety everywhere, including in the home and on the highway. Material in *The Circle-a-tor* often is concerned with outplant safe practices. In fact, the company actively promotes safety in the community as a whole, particularly in the schools.

Essay Contest—In the local junior high school, authorities co-operate in holding an essay contest. All students are required to write essays on safety, and those who wish may enter their compositions in a contest sponsored by Albion Malleable which offers $25, $15, and $10 first, second, and third prizes and a $5 honorable mention. Prizes are awarded at the spring assembly.

In addition, the company has helped to equip foundries in six high schools in the region—including schools at Kalamazoo, Battle Creek, Marshall, and Albion—and has given them safety equipment. This type of safety work is part of the plant's co-operation on an area basis to promote civic activities. At one time, Albion even sponsored a radio program on a local station to plug the theme "Work—Think—Live Safely."

The scope of Albion's program obviously goes beyond what many companies would find practical, or even necessary. It is tailored to the company, which is relatively large, and to the community, which is relatively small. But any foundry can create its own program, tailored to fit its needs, to do the same kind of job.

Management at Albion offers one final word of advice: A safety program requires continuous effort. It can't be an on-and-off proposition. Letting up on the campaign means increased accidents, for employees are no more vigilant than management indicates that it expects them to be. The fight against complacency never ends.

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Wearing safety shoes also is a condition of employment. Here are 36 different styles, from dress oxfords to boots, which are stocked by the company and sold to the employees at cost

Controlling Casting Quality through SAND TESTING

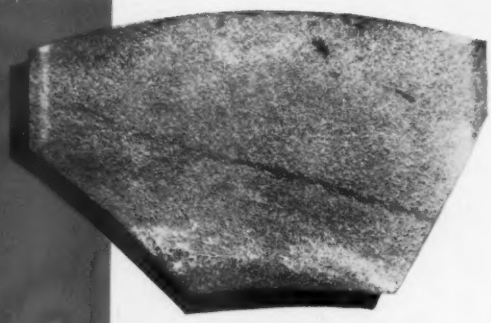


Fig. 1 — Cross-sectional view of a rat-tail loss

By HARRY W. DIETERT
Harry W. Dietert Co.
Detroit

Two practical and useful elevated temperature tests for molding sand now are available. They enable foundrymen to determine whether molds from a sand will yield castings free of scabs, rat-tails, and buckles

ADVANCEMENT in the science of sand testing has made available to foundrymen two practical and useful elevated temperature tests for molding sands. The restrained load test and the 1-psi loaded expansion test give foundrymen new control tools with which they can determine readily whether a mold made from a given sand will yield casting free from scabs, buckles, or rat-tails.

All of these losses are caused by mold-wall fracture due to sand expansion greater than the sand on the mold wall can accomodate by hot deformation. Fig. 1, 2, and 3 identify each of the above-mentioned losses. A rat-tail loss, Fig. 1, is caused by the mold-wall faces expanding and creating sufficient stress to fracture the mold wall and cause a slip plane.

When the magnitude of expansion exceeds accommodating hot deformation by a large value, one can expect the slip plane to produce a crevice large enough for the molten metal to run under the slip-plane edge of the mold face and form a thin metal projection on the casting surface. This type of casting loss is termed a scab and is illustrated in Fig. 2.

Under certain conditions, the expansion of the sand on the mold face is relieved by buckling of a thin layer of sand into the mold cavity in a V-contour. Such a casting loss is termed a buckle and is shown in Fig. 3.

All of these losses are expensive in the production of castings and are unnecessary since one can determine readily before a sand is used whether it will produce castings free of such losses.

Test Equipment—Mold hardness plays an important part in casting quality control. The latter requires high-temperature testing of sand in the laboratory and mold hardness control in the foundry. It is imperative to standardize on a range of mold hardness to which the mold in the foundry will be rammed. The mechanical properties of a sand are controlled largely by mold hardness, not by its composition. This fact accounts for the importance of mold hardness control.

All high-temperature test properties are governed largely by mold hardness. Thus the sand specimen used in high-temperature testing now is rammed to the same hardness as molds in the foundry. With such a procedure, it is possible to obtain excellent correlation between the restrained load test or the 1-psi load expansion test and casting quality in reference to scab, buckle, or rat-tail losses. A mold hardness tester, shown in Fig. 4, is used for both laboratory and foundry testing.

The sand specimen, $1\frac{1}{8}$ in. in diam and 2 in. long, is rammed to the selected hardness with a sand rammer, illustrated in Fig. 5. This sand rammer is equipped with an adjustable height-weight lifting device. The drop of the rammer weight can be adjusted readily to ram the sand specimen to a selected hardness.

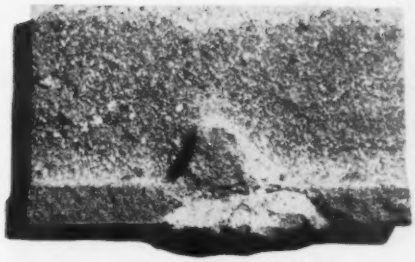


Fig. 2—Cross-sectional view of a scab loss

Fig. 3—Cross-sectional view of a buckle loss

Fig. 4—Mold hardness tester used to measure hardness of rammed sand

Fig. 5—AFS sand rammer for ramming elevated temperature sand test specimens to selected hardness

The rammed sand specimen is placed in a dilatometer (Fig. 6). If the sand is used for dry sand molds, sand specimens are dried before they are placed in the dilatometer.

The dilatometer consists primarily of a high-temperature furnace, a loading mechanism reading in pounds—or in kilograms when specified—and a means of measuring change in sand specimen length.

There are two methods of determining change in the length of the sand specimen. One method is by means of a dial indicator, as shown in Fig. 7. The other method employs a recording mechanism, Fig. 8, which records specimen length, load, and time.

Determination of Shock Load Expansion Test— These steps are involved in the determination of shock load expansion:

The shock load expansion test measured at 1800° F under a 1-psi load offers a single, simple high-temperature test which measures mold-wall fracture losses such as scabs, buckles, and rat-tails in iron molding sands. By this test, shock load expansion is expansion expressed in inches per inch of specimen length that a sand possesses when suddenly heated at a specified elevated furnace temperature under a specified load at a given green hardness.

Testing equipment includes a dilatometer consisting of a radiant-type furnace capable of operating at up to 2500° F, a frame supporting a top stationary refractory post and a bottom movable refractory post, and means of applying measured loads to the bottom movable refractory post, measuring the load, measuring movement of the bottom movable post within 0.001 in., measuring temperature within the furnace, and of controlling the temperature at a predetermined level. The setup required for this test is shown in Fig. 9.

Preparation of Test Equipment—The test specimen is the AFS tentative-standard, $1\frac{1}{8}$ x 2 in. specimen, formed in a ground and hardened steel specimen tube. The sand is passed through a 6-mesh screen and sealed in an airtight container. Test

specimens are rammed within six hours of the time that foundry molds are made if laboratory test data are to be correlated with casting quality.

Ramming is accomplished with the AFS tentative-standard, 1⅛ x 2 in. sand rammer, mounted on a concrete or steel pillar or a rammer subbase. Specimens are rammed to the same hardness to which the sand is rammed in the foundry.

When the sand rammer is equipped with an adjustable ramming device, trial-and-error specimens are rammed until the adjustable ramming device is set to the correct height to produce the desired green hardness. When the sand rammer is not equipped with an adjustable ramming device, one can obtain adjustable weight drop distances by bolting ½-in. washers together. Place the assembled washers under the rammer weight and suddenly pull out the washers to permit the weight to fall.

Test Procedure—Heat the furnace to the selected temperature (1800° F) and hold it there for one hour before starting the test with both refractory posts in the furnace.

Ram the test specimen, and place a 1⅛-in. in diam x ½-in.-high refractory disc with a convex face on top of the specimen. Next, set the specimen on a flat refractory disc of the same dimensions. Immediately place specimen and discs in the furnace. Be certain that both refractory posts make firm contact with specimen and refractory discs. This step is accomplished by applying a 1-psi load. Record the dial indicator reading at the start. If a deformation recorder is used to measure the length of the test specimen rotate the recorder drum to indicate the pointer position at start. Time for this operation is not to exceed 5 seconds.

Immediately start the stopwatch and maintain a 1-psi load on the test specimen. Record the dial indicator reading every 15 seconds up to the time that constant readings are obtained. Maximum time is 5 minutes. When a deformation recorder is used, the recorder should be equipped with a timer. Otherwise, mark the time with dots every 15 seconds.

The average of two such tests should be used.

Determination of Restraining Load—The restraining load of a sand measures the load in pounds per square inch that are required to hold a sand test specimen to a constant length when it is heated to an elevated temperature. Restraining-load-test values correlate well with mold-wall fracture losses when a test temperature of 1800° F is used.

As determined by this test, restraining load is the load, expressed in pounds per square inch, that must be placed on a 1⅛ x 2 in. specimen to cause the hot deformation of the sand to absorb the expansion of the sand while length of the test specimen is held constant. Time, green hardness, and furnace temperature are to be stated with the restraining load. This test requires the same equipment as the shock load expansion test, as shown in Fig. 9. Preparation of the test specimen and the test procedures also are the same up to the point at which the test is started.

Immediately start a stopwatch and apply sufficient

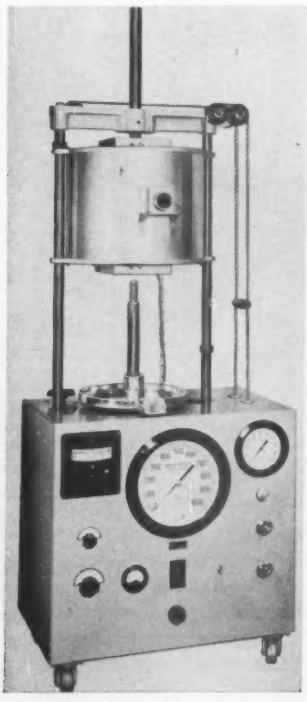


Fig. 6—Dilatometer measures load expansion and restrain load properties of molding sand

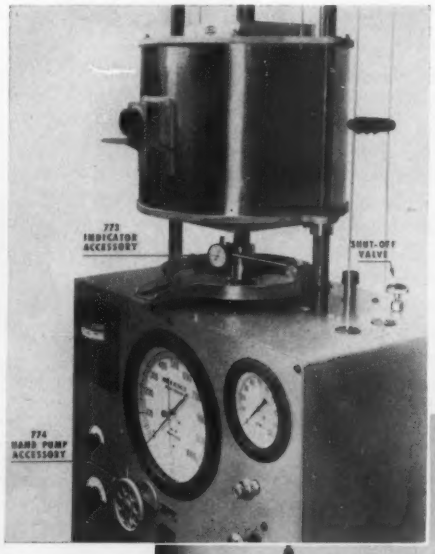
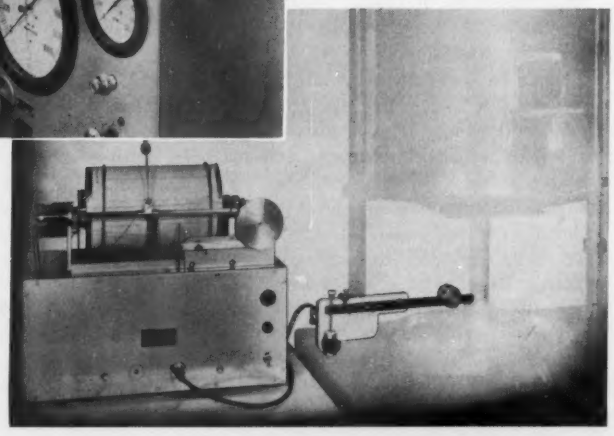


Fig. 7—Illustration of dial indicator method of measuring the load expansion property of molding sands

Fig. 8—The recorder method of measuring load expansion property of molding sands



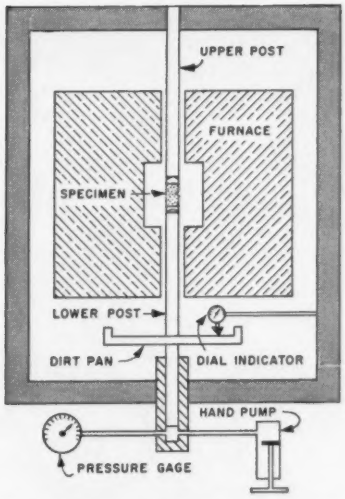


Fig. 9—Diagram of dilatometer setup for determining load expansion or restraining load test of molding sands

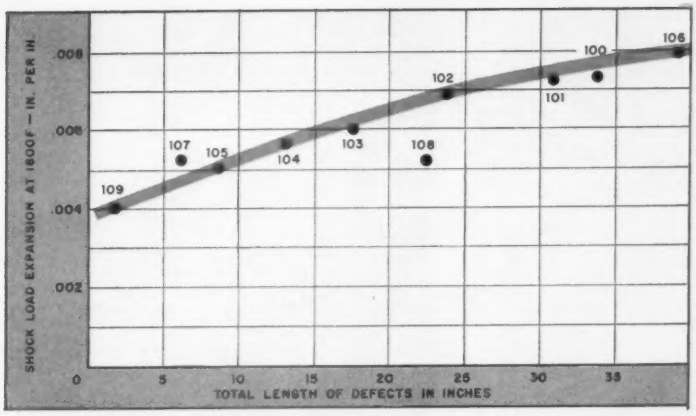


Fig. 10—Chart shows the correlation between load expansion and scab, rat-tail, and buckle losses

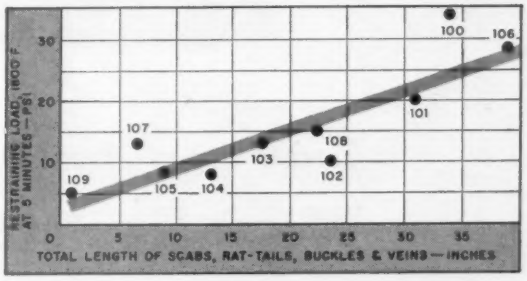


Fig. 11—Correlation between restraining load and scab, rat-tail, and buckle losses

load with a hand-loading device to keep length of the test specimen constant within ± 0.001 in. Any change in the length of the test specimen is shown by the dial indicator of the deformation recorder. Adjust the load to hold the indicator reading constant. Record the load in pounds per square inch together with time of heating, furnace temperature, and grain hardness. At the end of the test, remove the specimen and discs. Thoroughly clean the discs and the ends of the refractory posts. An average of ten such tests should be used.

Gray Iron Molding Sands—The AFS 8-J Committee has found excellent correlation between test data obtained by the shock load expansion test and casting losses due to scabbing, rat-tailing and buckling. The graph shown in Fig. 10 illustrates the close relation that this committee has found between shock-load expansion values of sands used for gray iron casting and the magnitude of mold-wall fracture losses.

The greater the size of the loss as measured in the total length, the greater the load expansion reading.

The committee also found good correlation between these mold-wall fracture losses and the magnitude of restraining load test values. This relationship is shown graphically in Fig. 11.

It can be noted that load-expansion values fall on a straight line, whereas restraining load values show some scatter. The scatter of the restraining load values could have been reduced if averages of ten tests had been used. The graphs in Fig. 10 and 11 were constructed from averages of three tests. As noted previously, the load expansion test requires fewer tests than the restraining load test.

Either the load expansion or the restraining load test can be used to determine whether a gray iron sand will or will not scab, rat-tail or buckle. One readily can determine the safe values for either test from practice, in his own foundry. As a starting guide, the following values may be used:

A load expansion value below 0.004 in./in. or a restraining load value below 4 psi designates a sand safe from the danger of mold-wall fracture losses in gray iron castings.

Cellulose materials, seacoal, cereal binders, and pitch are good additives to reduce the load expansion of sands for gray iron.

Steel Molding Sands—The AFS 8-L Committee found that the restraining load test is the best to determine whether or not a steel molding sand will scab. Correlating the restraining load test values with steel castings, this committee found that steel sands which possess a restraining load above 50 psi will scab. The usual sand additive used to lower the restraining load for steel sands is cereal binder.

Conclusion—The American Foundrymen's Society, through Committees 8-J and 8-L, has given the casting industry valuable test methods which can be used readily in foundry practice to advance the quality of both gray iron and steel castings.

Reduction in cost also is possible through the use of these test methods by avoiding loss of castings. It is possible to establish before a sand is used in the foundry whether it possesses an ample safety factor to prevent mold-wall fracture losses.

Both the load expansion test and the restraining load test are simple to perform. They offer a distinct advancement in sand control and testing.

This paper was presented at the 1st Foundry Symposium and Exhibition, Institute of Indian Foundrymen, early this year.

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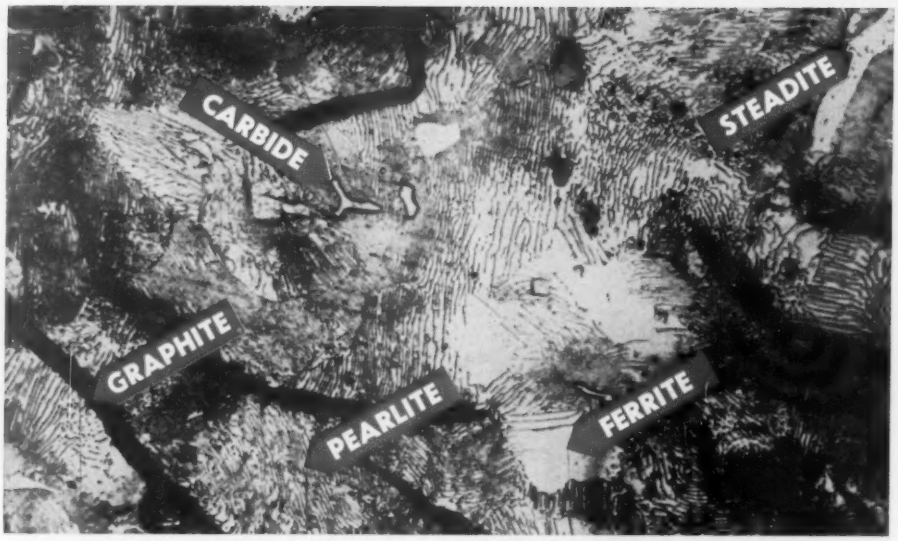

Fig. 1 — Microstructure of gray iron usually contains these constituents. Nital etch

By JOSEPH R. DRIEAR
Senior Engineer
Development Engineering
Westinghouse Electric Corp.
Cheswick, Pa.

Gray Iron Has Unique Wear-Resistant Properties

Gray irons have unique properties which make them work under some conditions of boundary lubrication where other materials fail. The success of an iron depends on its microstructure and other factors

IN merchandising the unique properties of gray iron, its producers should pay special attention to those casting applications where boundary lubrication is encountered.

Boundary lubrication describes a condition where presence of the film of lubricant between moving parts is intermittent. Dry periods occur when the moving parts are not separated by an oil film and are in intimate contact.

With many metals this intimate contact will result in galling and welding together of the parts. Not so with some gray irons. The graphite flakes in gray iron act as a source of graphite which smears over the surface of the iron during dry periods of the lubrication cycle. This film of graphite keeps the parts from galling and welding.

Microstructure the Factor—Not all cast irons will work well under conditions of boundary lubrication. Success depends on the microstructure of the iron and on the load carried by the mating surfaces.

Fig. 1 shows the constituents usually found in the microstructure of gray iron. The role of each constituent may be summarized as follows:

Graphite Flakes—Source of graphite film which prevents galling and welding during dry periods.

Ferrite—Soft gummy iron which promotes welding during dry periods and off-sets the effect of graphite.

Pearlite—Strong structure which neither promotes nor reduces the tendency of an iron to galling.

Iron Carbide (*Cementite*)—Hard; neither promotes nor reduces tendency to galling; makes iron more wear resistant and harder to machine.

Low Unit Loads—Assuming relatively low unit loads (up to 10,000 psi), iron for use in boundary lubrication conditions should have plentiful graphite flakes and no large areas of ferrite in the microstructure. One iron that fills these needs is pearlitic iron having a microstructure like that shown in Fig. 2. Another iron that meets this purpose is a ferritic iron which has been heat treated (oil quenched from 1600° F, tempered at 600° F) to

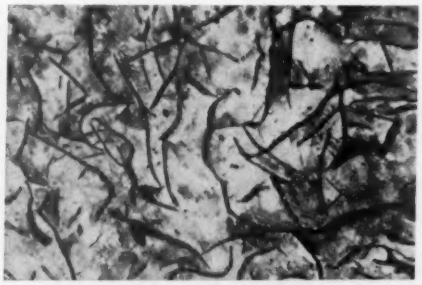

Fig. 2—Microstructure of pearlitic iron suitable for use in boundary lubrication. X100

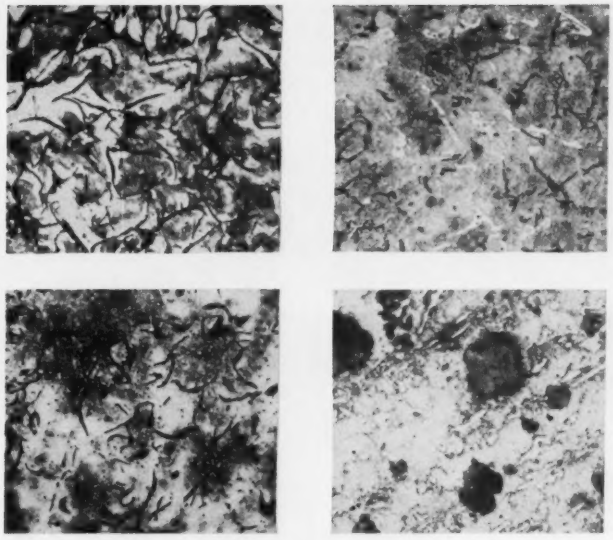

Fig. 3 (left)—After heat treating, free ferrite (top) is eliminated (bottom). X100. Fig. 4—Top iron ran successfully under boundary lubrication conditions. Bottom iron, same hardness, failed

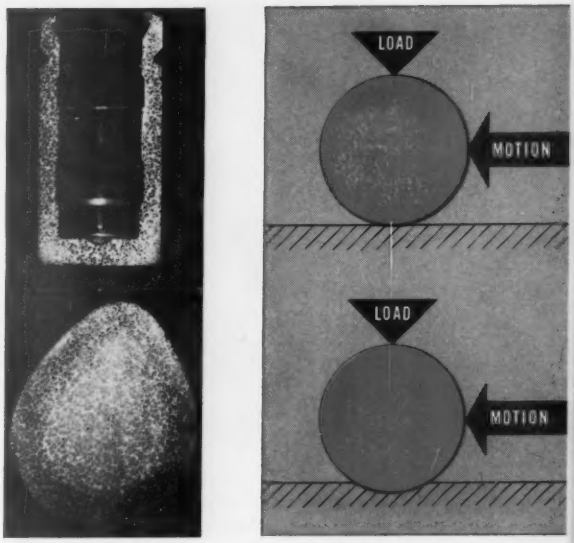

Fig. 5 (left)—Carbide network in automotive tappet and camshaft lobe. Fig. 6 (right)—Top, high modulus material, high unit contact stress. Bottom, low modulus iron deflects, reduces stresses

eliminate large areas of ferrite from the microstructure, Fig. 3.

With cycles having longer dry periods, the size and type of graphite flakes become increasingly important. In a pump part operating under boundary lubrication conditions, a gray iron with a flake graphite worked well but another iron with nodular graphite, Fig. 4, did not run successfully.

Both irons were heat treated to 512 bhn by heating at 1600° F and oil quenching. The difference between success and failure was the shape and distribution of the graphite. Flake graphite is always best.

In some cases of slight boundary lubrication, irons containing ASTM Type D and E graphite will be satisfactory if they are heat treated to eliminate large areas of ferrite in the microstructure. A typical heat treatment to accomplish this condition consists of heating at 1700° F (allow 1 hour heating time per inch of cross section), oil quenching, and drawing at 600° F.

As boundary lubrication conditions grow more severe, however, uniform distribution of large graphite flakes becomes essential. Iron having type A graphite, ASTM size 5 or larger, and pearlitic matrix becomes necessary.

So far, conditions have assumed relatively low unit loads.

Higher Unit Loads—As the unit compressive loading goes up into the range 10,000 to 100,000 psi, less boundary lubrication can be tolerated for successful operation. Irons for these applications depend more and more on wear-resistant iron carbide in the microstructure for success. A good example is the carbide-rich alloy gray iron used in some automotive cam and tappet parts shown in Fig. 5.

A typical analysis of one of these irons shows chrome and moly have been added to promote formation of carbides, as follows: TC 3.20 per cent, Si 2.20, Cr 1.15, Ni 0.55, Mn 0.80, and Mo 0.60. Graphite flakes, however, are still present in the iron to provide a nonwelding film.

In some of these applications another precaution is used. An oil-retaining coating such as iron phosphate or iron oxide is applied to the wearing surfaces to retain the oil film during more of the operating cycle and thus reduce the periods of boundary lubrication.

In certain applications, surprisingly enough, using a weaker iron (one having a low modulus of elasticity such as 30,000 psi iron—Class 30—not heat treated) lowers contact stresses and makes a successful application. As shown in Fig. 6, the weaker iron deflects under load. This deflection increases the load-bearing area and reduces contact stresses thereby. Calculations in one application showed the following reduction in contact stresses with reduction of material modulus for a given load:

Material	Modulus of Elasticity	Contact Stress
Steel	29,000,000 psi	100,000 psi
Gray iron	15,000,000 psi	70,000 psi

Conclusion—Gray irons have unique properties which make them work under some conditions of boundary lubrication where other materials fail. Attention to certain basic facts of microstructure, lubrication, and loads involved can lead to successful applications of gray iron in many wear situations. If the situation looks promising, submit samples. The final test is whether the iron works.

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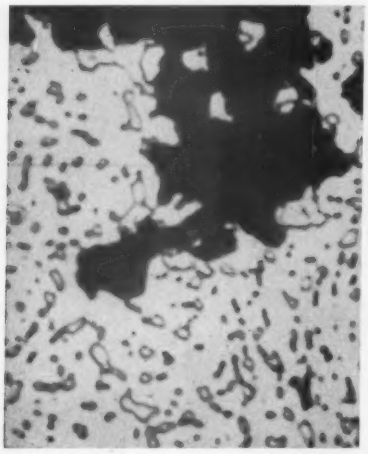

Fig. 1—Alloy produces more uniformity, especially after long drawing for better spheroidization

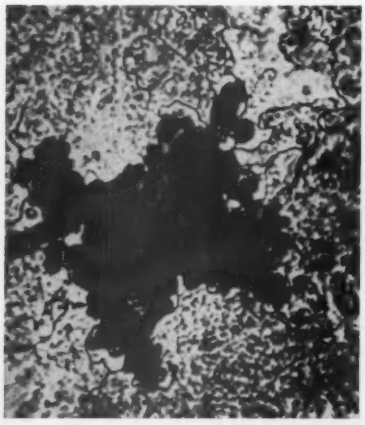

Fig. 2—Base metal without excess alloys can be air blast quenched to avoid free ferrite in thin sections

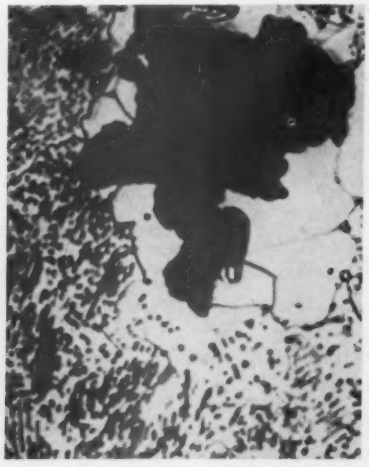

Fig. 3—With liquid quenching, the heavy sections unavoidably possess more or less free ferrite

History . . . . . .

Manufacture and

. . . Properties of

Pearlitic Malleable Iron

This article presents a comprehensive review of the development, production, applications, and properties of pearlitic malleable. It was the AFS exchange paper to the 1957 annual meeting of Australian Branch, Institute of British Foundrymen

By MILTON TILLEY
Assistant Director of Research
National Malleable & Steel Castings Co.
Cleveland

PEARLITIC malleable originated from a desire of the malleable iron industry to produce from its base metal a controlled product possessing more strength, wear resistance, differential hardening properties, and resistance to warpage under heat.

These steel-like properties (except for warpage) were obtained by low alloying and/or heat treating the base metal, while maintaining good machinability because of the relatively large percentage of retained free graphite. Obviously, this castable metal lends itself to economical substitution for difficult forgings and weldments. As the trades became aware of the characteristics of this product, they became interested in reducing weight.

Aside from European whiteheart malleable, early mention of controlled pearlitic malleable appears about 1919.[1] One of the first applications of considerable tonnage, in the middle 1920s, was in castings where resistance to warpage was the main factor and resistance to wear welcomed. One of the earlier uses was in pan mill segments where resistance to wear, castability, and strength were useful.

About this same time the link chain conveyor manufacturers, recognizing the rust resistance, castability, wearing qualities, and economics of pearlitic malleable, substituted for malleable and converted from forgings and have produced large tonnages in the last 30 years. In the middle 1930s the automotive trade became interested in substituting pearlitic malleable for malleable differential cases in truck axles where resistance to deformation and wear are important. Many thousands of tons per year are used.

During World War II one large foundry supplied the Army with machine gun parts, enabling the armed forces to obtain these guns in sufficient quantities when forging capacity was at a premium. Hardness of these parts was in the order of 400 bhn.

Another large tonnage market of recent years is in automatic transmission parts and crankshafts. Other applications include automotive engine rocker arms, brackets of all kinds, wheel hubs, brake spiders, railroad journal box adapters, wrench handles, and many others.

Metallurgy and Types—Briefly, the metallurgy consists of so heat treating the base metal as to retain a predetermined amount of combined carbon as pearlite, or, by low alloying with a carbide stabilizer, retain pearlite without depending on the rate of cooling. If freedom from free ferrite is desired, however, a controlled rate of cooling through the critical zone is essential in either case.

Freedom from free ferrite is desirable for 1) a higher yield to ultimate strength ratio and 2) better differential hardening characteristics.

Useful combined carbon may be varied from about 0.20 to 1.00 per cent with hardnesses from about 170 to 400 bhn depending on the heat treatment. Mechanical properties vary from around 45,000 to 85,000 psi yield strength and 10 to 2 per cent elongation, with brinell hardness of 170-285. Better grades of base metal, such as 35018 malleable, will result in better properties.

Alloying possesses the advantages of more freedom from dependence on cooling rates and from graphitization during cooling from the first stage and heat in the drawing treatment. This is particularly so in the relatively slow cooling center sections of the heavier parts or heat treated loads. Alloying also results in more uniformity, especially after long drawing for better spheroidization (Fig.

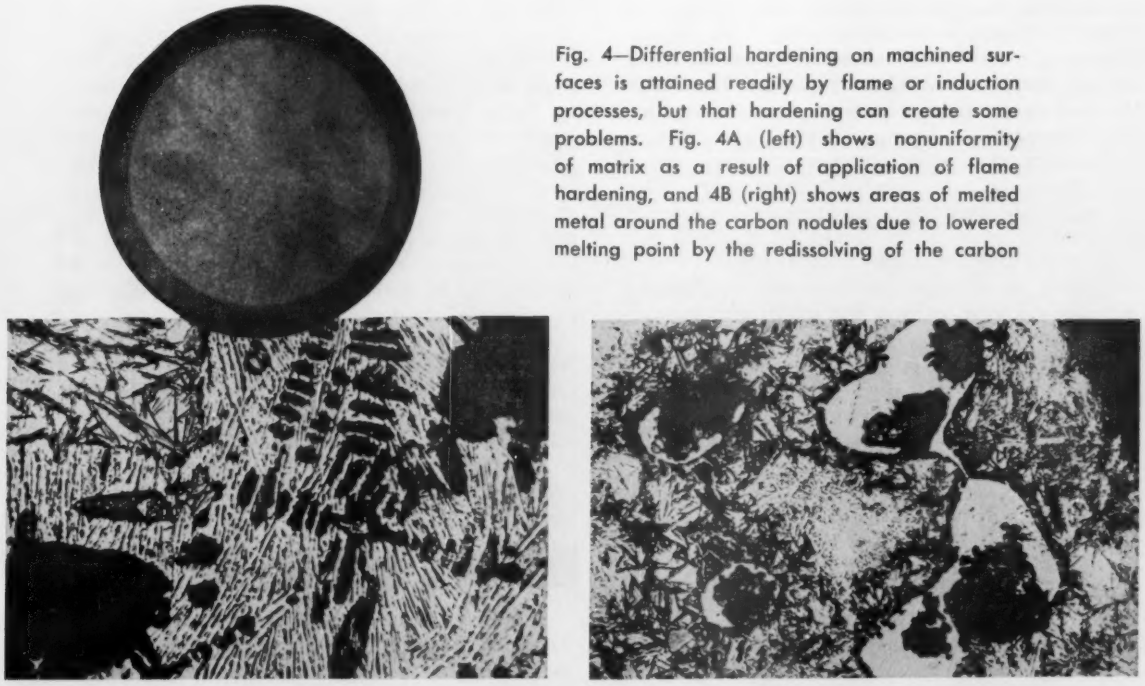

Fig. 4—Differential hardening on machined surfaces is attained readily by flame or induction processes, but that hardening can create some problems. Fig. 4A (left) shows nonuniformity of matrix as a result of application of flame hardening, and 4B (right) shows areas of melted metal around the carbon nodules due to lowered melting point by the redissolving of the carbon

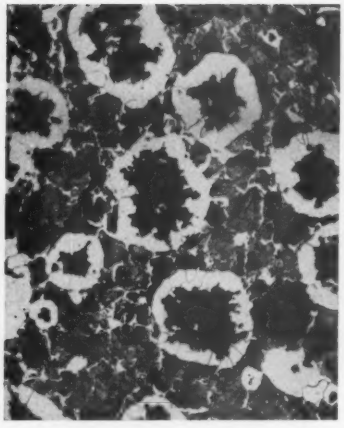

Fig. 5—Ferrite surrounds carbon nodules and in turn is itself surrounded by pearlite

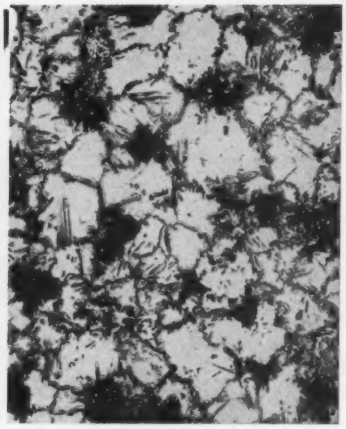

Fig. 6—By close control of reheat temperature, carbon dissolves in austenite

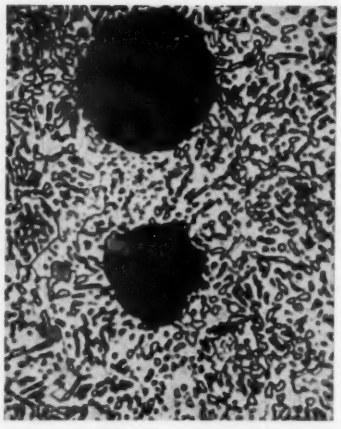

Fig. 7—Closely packed carbon nodules and freedom from mottling give improved properties

1). In addition, graphitization is retarded when the metal is subjected to heat in service.

Obviously, the cooling rate depends on the section size and mass of castings handled. Although the metal is quenched from austenitizing temperatures, the alloy content is such that in no case is austenite retained. The fastest rates result in martensite and then on down to coarse pearlite as the cooling rate slows; then finally to free ferrite and coarse pearlite.

In these slower cooling heavier sections the graphitizing reaction becomes evident with the attending softer centers. The faster the quench, producing unstable carbide phases, the more readily spheroidization is accomplished on subsequent application of heat below the critical range.

Base metal containing no excess alloys may be air blast quenched fast enough to possess practically no free ferrite in thinner sections, if the castings are cooled more or less individually, and the pearlite will readily spheroidize (Fig. 2). The slower the cool in the heavier sections the more free ferrite, the softer the center with respect to the edge, and the more difficult the spheroidization. By liquid quenching, the thinner sections may possess up to a fully martensitic structure, which spheroidizes very readily. The heavier sections will possess more uniform hardness throughout with a minimum of free ferrite. However, the heaviest sections will have more or less free ferrite unavoidably (Fig. 3).

Alloyed metal will quench to martensite in heavier sections than unalloyed since the knee of the S curve is moved to the right. The heavier sections are freer from graphitization and free ferrite and will be more uniform throughout.

Manganese Is Usual Alloy—The most commonly used alloy is manganese up to about 1.25 per cent total because it has little primary carbide stabilizing effect and is economical. Molybdenum is also used up to about 0.40 per cent, and copper is added up to about 0.75 per cent where added resistance to corrosion is desired such as in chain links used in oxidizing environments.

In the last seven years some interest has been aroused in the use of sulfur in sufficient quantities to produce a compact graphite nodule such as is found in nodular iron and whiteheart malleable of relatively low manganese, high sulfur content. The objective is improvement in mechanical properties and freedom from mottling.[2, 3]

Differential hardening on machined surfaces by flame or induction processes is readily attained (Fig. 4). The higher combined carbons and freedom from free ferrite are desirable where a minimum of 50 Rc is expected. It is difficult to obtain the higher hardnesses on cast surfaces, because the metal has a tendency to freeze differentially at the extreme edges with about 0.75 to 1.00 per cent carbon up to 0.025 inch depth[4] and it is very difficult to avoid some decarburization during heat treating.

Some problems are encountered in attempting to obtain the higher hardnesses, due to the high heat required or misapplication of the heat, particularly in flame hardening. Nonuniform hardness may result such as shown in Fig. 4 (courtesy of Howell Greatorex, Ley's Malleable Iron Co., Derby, England). Fig. 4A shows nonuniformity of the matrix as a result of an application of flame hardening, and 4B shows areas of melted metal around the carbon nodules due to lowered melting point by redissolving of carbon. This nonuniformity may be alleviated by tempering.

It is important to bear in mind that in striving for better yield ratios and differential hardening characteristics by higher combined carbons, faster quench rates and increased alloy content, those casting designs liable to high stresses are subject to cracking in quenching. This condition is alleviated by controlling the quenching medium temperature at the highest point practicable.

HEAT TREATING METHODS

Alloyed Pearlitic Malleable Iron—Interrupted Anneal—The warp-resisting type of metal mentioned earlier, in the foundry specializing in this

product, is alloyed with ferromanganese added to the bull ladle, using about 0.35 per cent excesss manganese. The castings are annealed in a muffle furnace of about 40-ton capacity. At the end of the first stage graphitization, the furnace is cooled to just above the metal's critical zone where the furnace doors are opened and the muffle seal broken to cool the castings at about 50° per hour. The metal has a hardness of about 200 bhn and a bull's-eye structure, i.e., carbon nodules surrounded by ferrite which, in turn, is surrounded by pearlite (Fig. 5). The pearlite furnishes wear resistance and the ferrite provides an absorber of stresses, resulting in a casting resistant to warpage. The alloy stabilizes the pearlite to resist graphitization during periods of overheating which would lead to growth and warpage.

A more modern method of heat treating would be by the use of lighter tonnage loads in bell type or continuous furnaces controlling the rate of cool to obtain the bull's-eye structure.

Alloyed Pearlitic Malleable Iron—Fully Annealed—By the use of the higher percentages of carbide stabilizers the product may be annealed in the malleableizing furnaces at hand, along with malleable castings, resulting in a lamellar pearlite matrix with more or less bull's-eye structure. The metal may be subsequently drawn for spheroidization of the pearlite. Or the spheroidizing time may be incorporated in the original heat cycle if desired.

Alloyed Pearlitic Malleable Iron—Air Blast or Liquid Quench and Drawn—Here the castings are air blast or liquid quenched, after completion of the first stage, from a temperature just above the critical range and then drawn. The properties are subject to the afore-mentioned limitations according to the rate of cool. For large tonnages the bell-type furnace in conjunction with a gantry crane or continuous types are recommended. Some trouble may be encountered with cracking on fast-cooling castings whose design subjects them to severe stresses.

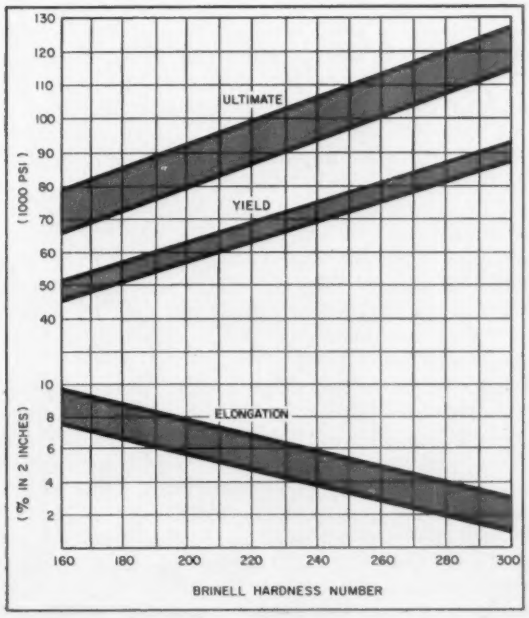

Fig. 8—Chart shows typical mechanical properties of pearlitic malleable iron

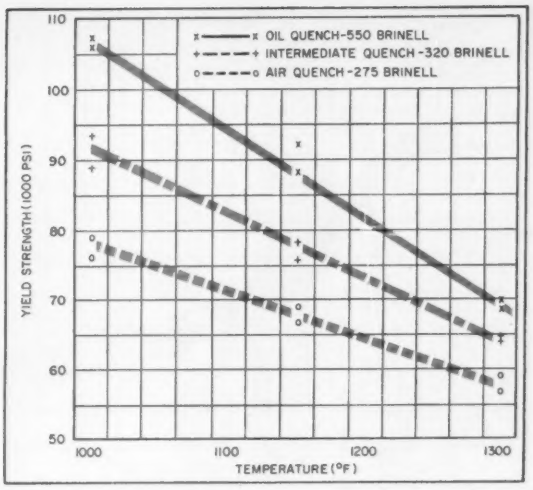

Fig. 9—Yield strengths from various drawing temperatures and relation to quenching rates

Unalloyed Pearlitic Malleable—One of the first metals of this type was produced by reheat treating fully malleableized castings. It utilized the characteristic that by closely controlling the reheat temperature just inside the critical range, in the order of plus or minus 15° F, the carbon dissolves in austenite first produced at the grain boundaries[5] (Fig. 6). Obviously, this relatively low percentage of carbide limits the product to the lower hardnesses. The metal possesses remarkably good mechanical properties, however, and is uniform throughout. Improvement in ductility is gained by subsequent tempering according to the cooling rate imposed.

Since the critical zone changes with varying compositions, a problem of control is presented. In case the castings receive a too-high temperature, the carbon diffuses throughout the ferrite grain and will be harder and more brittle than desired. This metal must then be drawn at appropriate temperatures to reclaim it. The method lends itself to starting production of pearlitic malleable with a relatively low capital expenditure.

Because of the difficulty of controlling the temperature to such a close range, however, a better method is to reheat and hold to stability above the critical zone in small batch-type furnaces, air blast or liquid quench, and draw to the desired hardness. This method probably requires the least capital expenditure.

By far the greatest tonnages are produced by these two methods: 1. Air blast or liquid quench from the completed first stage at a temperature just above the critical range and then draw. 2. Air cool from the first stage to a temperature below

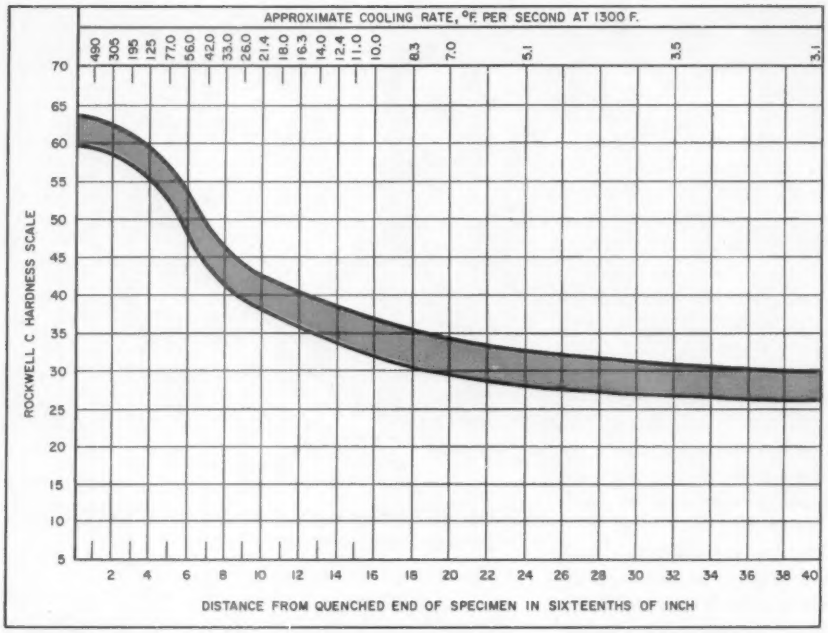

Fig. 10 — Typical hardenability, Jominy end quench. Alloying improves hardenability

the critical zone, reheat and hold to stability, then air blast or liquid quench followed by a draw.

The reheat step is used to save time in cooling of heavier loads in batch-type furnaces from the first-stage graphitizing temperatures to the quenching temperatures. It also minimizes cracking of the castings, particularly in the faster quenching rates. In addition, closer control of the prequenching temperature and, therefore, more uniform properties are possible as demonstrated in normalized and quenched steels. This method is used to attain the ultimate in mechanical properties in the higher hardness range.

High-Sulfur Pearlitic Malleable—The incentive in producing a nodular type pearlitic product from a malleable base iron by alloying with sulfur is the improved mechanical properties. They stem from the closely packed carbon nodules and freedom from mottling in heavy sections[2, 3] (Fig. 7). So far this metal has had limited application since to attain the carbon form, the carbide stabilizing sulfur content of some 0.30 per cent excess results in the higher percentages of combined carbon. Also, the primary carbides are so stabilized that long times at high temperatures are required. Then, too, the high-sulfur sprue returning to the base metal presents the problem of either desulfurizing or producing in a separate unit.

Salt Bath Pearlitic Malleable—Finally, it is of interest to note that austenitizing, quenching and tempering in salt baths may be used in some highly specialized castings where the economics justify. Excellent properties are so attained.

Properties—Pearlitic malleable iron is unique in that it is capable of a wide range of properties and is quite versatile in methods of production. Because of the high carbon content it is very castable and may possess a wide range of combined carbons as pearlite while retaining good machinability due to the relatively high percentage of free carbon.

All the following properties are predicated on a base metal of standard malleable iron of 32510 Grade.

Typical mechanical properties are shown in Fig. 8. Alloying improves yield and ultimate strength as well as a base metal of 35018 Grade. The fastest rate of quench and, therefore, the highest quench hardness results in the best yield to ultimate strength ratio. The slower the quench rate the lower the ratio. The more the percentage of free ferrite, the lower the yield ratio and the more difficult the differential hardening.

Typical yield strengths resulting from varying drawing temperatures and their relation to quenching rates are shown in Fig. 9.[6] Here again the yield strengths are improved by alloying and by the 35018 Grades of malleable base iron.

The intermediate quench hardness is typical of time quenching in water to reduce cracking of the castings where the castings are removed from the liquid as soon as they are safely under the critical range. An additive is introduced into the water to reduce the transfer of heat to approach that of quenching oils.

Fig. 11, from unpublished data, presents comparative hardenability of two standard pearlitic irons A and B, which represent about the normal range, and an alloyed pearlitic iron, D, containing about 0.25 per cent excess manganese. The chart also includes C, a curve for 1050 steel.

The fact that B, with an original hardness of 217 bhn, is harder than A (187 bhn) has no significance since the Jominy test of heating to 1600° F destroys the effect of previous treatment.

More alloying improves the hardnesses shown in D, and more attention to this phase will open a

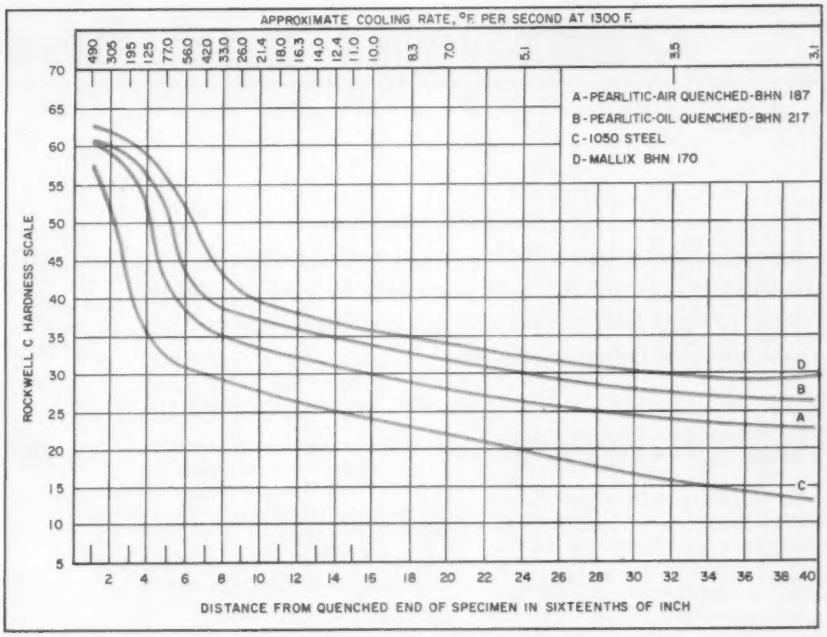
APPROXIMATE COOLING RATE, °F. PER SECOND AT 1300 F.
490 305 195 125 77.0 56.0 42.0 33.0 26.0 21.4 18.0 16.3 14.0 12.4 11.0 10.0 8.3 7.0 5.1 3.5 3.1
A-PEARLITIC-AIR QUENCHED-BHN 187
B-PEARLITIC-OIL QUENCHED-BHN 217
C-1050 STEEL
D-MALLIX BHN 170
ROCKWELL C HARDNESS SCALE
70 65 60 55 50 45 40 35 30 25 20 15 10 5
D
B
A
C
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
DISTANCE FROM QUENCHED END OF SPECIMEN IN SIXTEENTHS OF INCH

Fig. 11 — Comparative hardenability of two standard pearlitic irons and an alloyed pearlitic iron

wider field for this metal than has been explored so far.

Transition (Charpy-temperature) curves for malleable and pearlitic malleable are compared in Fig. 12 from unpublished National Malleable Research data. Here again the values indicate that Charpy values do not portray adequately the ability of malleable base metals to withstand impact. However, they serve to compare these two metals.

Pellini and co-workers of the Naval Research Laboratory[8] report that pearlitic malleable iron of the reheat treated and air blast quenched and tempered type, and having hardness of 160 to 190 bhn, develops nil ductility transition temperatures of −10 to 70° F, which are comparable to those of steel.

Fatigue ratio, as in all ferrous metals, is around 50 per cent of the ultimate strength.

Modulus of elasticity has been measured as 24 million to 26 million.[9]

Damping capacity is in the same order of magnitude as 4130 steel, soon to be published.[10]

Because of the difficulty of evaluating machining characteristics, due to variables encountered in cast surfaces and standardization of tooling, this subject is presented as a generalization of comparative data, using numbers based on high-sulfur free machining SAE 1112 steels (179-228 bhn) designated as 100: Standard malleable iron (110-145 bhn)—120. Pearlitic malleable iron (197-241 bhn)—80. Gray iron (163-197 bhn)—80. SAE 1045 (179-228 bhn)—60. Gray iron (212-241)—50.

Acknowledgments—The author wishes to express his gratitude to the National Malleable & Steel Castings Co.'s research staff for its co-operation in preparing this paper. To Ann Nicholson Hird for the metallography, Joseph Wasdovich for charts and especially Dr. W. Kenneth Bock, director, for his invaluable aid in preparing the paper and bibliography.

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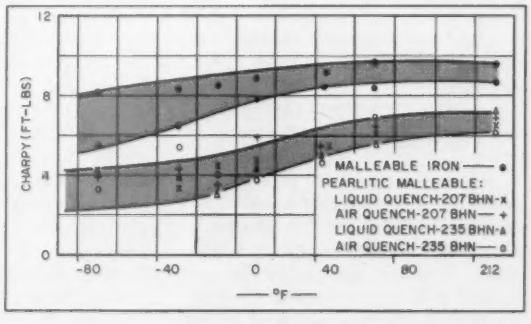


Fig. 12—Transition (Charpy-temperature) curves for malleable and pearlitic malleable

Questions and Answers

Variety of coatings available to protect metal mold face . . .
Porosity is encountered with centrifugally cast steel pipe . . .
Glass coating fails to cover all areas on gray iron casting . . .
Two types of defects are shown

Coatings Used on Metal Molds

For some time we have specialized in production of gravity die cast aluminum castings, and now are considering the manufacture of brass, tin bronze, aluminum bronze, and other castings by the same process. Can you supply us with any information on suitable dressings or coatings for the dies?

Gravity die casting or permanent mold casting firms engaged in producing copper-base alloy castings apparently have as many ideas on suitable die or mold dressing or coatings as their counterparts in the field of aluminum castings. Some use two types of coatings which commonly are referred to as permanent and semi-permanent, but technically they are insulating and lubricating respectively. Others use a single coating containing materials providing both properties.

Insulating type coatings for copper-base alloys seem to be quite similar to those employed for aluminum-base alloys. They usually are comprised of a refractory such as whiting, kaolin, aluminum oxide, mica, talc, etc., suspended in water with or without a small amount of sodium silicate. Lubricating type coating usually is graphite suspended in water and sometimes includes additions of rouge, mica, talc, etc. The combination-type coating is composed of the refractory plus graphite, etc.

Where the two types of coatings are employed, the insulating type is applied first. Since it generally has good adhesive qualities, it remains in place for a considerable period of time—hence, the term "permanent" coating. The lubricating type apparently does not appear to adhere well, and it is renewed from time to time; thus it often is referred to as "semi-permanent" coating. The combination type is only applied once, appears to have a reasonable life, and is renewed as operations require. It might be pointed out that a number of proprietary materials are on the market, and you undoubtedly will be much farther ahead by obtaining one of them instead of trying to concoct one of your own.

Steel Pipe Exhibits Porosity

We operate a steel foundry in Japan, and are having difficulty with shrinkage cavities and porosity in centrifugally cast steel pipe. Can you suggest means for overcoming those troubles?

Since no information is given on your procedures in producing centrifugally-cast steel pipe, no definite suggestions can be offered on methods of eliminating the difficulty you term shrinkage cavities and porosity. Possibly the proper rotational speed is not being employed. If the speed is too high the mold may vibrate and cause the trouble. Speeds which are too low result in failure of the molten metal to be picked up and carried against the mold face. Some of the metal is carried only part way up, then falls back in the form of droplets. That condition aptly is termed "raining," and it causes defective castings. Proper speed for work spun on the horizontal axis may be ascertained from the formula 265.3 times the square root of Q divided by D, where Q is the mass, and D is the pipe diameter in inches. Value for Q usually is given as 60 for unlined metal molds, and 75 for those lined with sand. For example, a metal mold for a 9-in. diam pipe would be rotated at 684 rpm while a sand-lined mold would be spun at 765 rpm.

Another factor to be considered in relation to your problem is the metal temperature, which may be such as to cause a steep temperature gradient and result in disturbing the desired solidification progress from mold wall to inner wall or bore. Also, the rate of pouring the molten metal into the mold might be a factor.

Microstructure Causes Defect

We are making some gray iron castings which are used as nozzles or forming dies on an extrusion press. The operating face of the casting is coated with glass prior to use. In the glass coating operation, however, small areas or patches appear on which the glass does not adhere. Examination of those areas indicate that they exhibit types D and E or interdendritic graphite formations. It is believed that this condition prevents adherence of the glass since no difficulty is encountered with normal graphite structure. Can you suggest means of eliminating the undesired structure?

Formation of types D and E or interdendritic graphite is usually attributed to the phenomenon of undercooling, which delays the start of solidification of the austenite-graphite eutectic until the iron temperature has dropped below that of the austenite-graphite arrest. That formation can be prevented or reduced to a minimum by addition of some type of graphitizing agent to the iron in the ladle. Termed inoculation, that practice causes the iron to follow normal solidification resulting in the usual type A flake graphite.

A number of materials are available for ladle inoculation, and include ferrosilicon and coarse graphite as well as proprietary combinations on the market sold under tradenames. As a general rule, only small amounts of those materials are needed to obtain the desired results, and you will have to carry on some trials to determine the amount of the addition. Another type of ladle treatment which is reported to provide marked structural changes in iron is the injection of calcium carbide, through an inert gas carrier, into molten metal.

Gives Casting Gating Methods

We have been experiencing considerable trouble with internal porosity in a gray iron casting, as you will note from the sectioned specimen we are sending for examination. Casting is about 7½ in. long and 3¼ in. square, with an opening in the center. We have tried two methods of gating. In one we used two risers 2 in. in diam on opposite sides in the center of the long dimension. Gates into the casting were ¾ in. in diam, and distance from risers to casting was ¾ in. Risers extended 7 in. above the centerline and 1¼ in. below. Upper parts of the risers were cupped out to about 4 in. in diam. Risers were fed from a single sprue using a semicircular runner. In the other method of gating we used a single riser similar to those described which was attached near one end. Gate into the casting was 2 in. high and ¾ in. wide. We use a natural sand and mix our own facing with western bentonite and seacoal. Moisture content is 3.5 to 4 per cent. Iron contains 2.0 per cent Si, 3.40 per cent TC, 0.095 per cent S, and 0.60 Mn. Core is well vented and vent is carried outside the mold. We would like your opinion on whether this is a gating, core, iron, or molding problem, and we would appreciate methods to overcome the trouble.

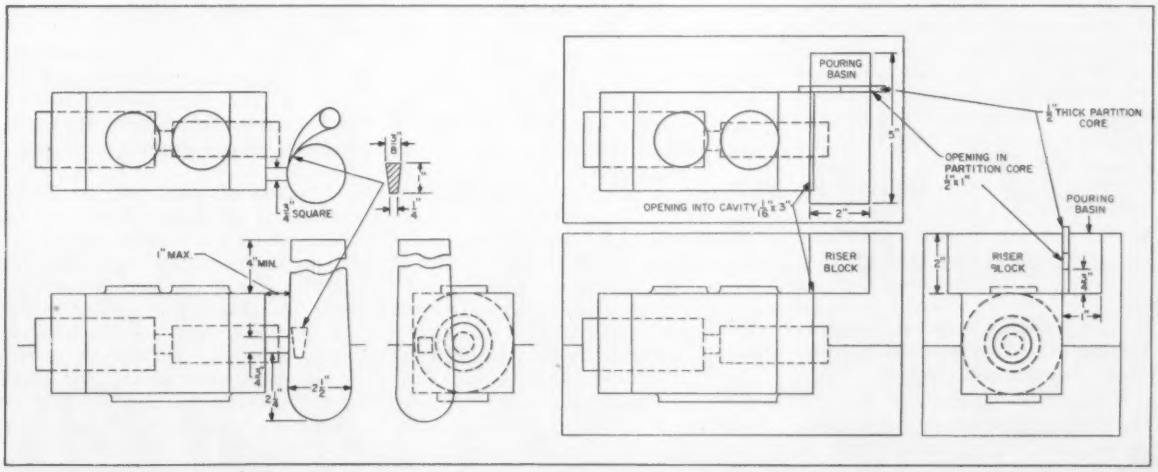
Answering your last question first, the problem is one of gating since the defect is a shrink. Although it would appear that the riser systems you describe should be adequate, they fail to function because they lack certain requirements. Winte and Barlow in an article "Effective Shrink-Bob Risers" which was published in the August, 1945 issue of

Location of shrinkage area

FOUNDRY state, "One of the failings of gating systems utilizing the principles of gating through the riser is absence of sufficient depth of the drag bob (the portion of the riser below the gate into the casting cavity) to provide proper relationship between the metal in the riser and the liquid metal in the casting."

In the article the authors provide information on sizes of suitable risers, dimensions of gate between risers and mold cavity, and depth of drag bob which ranges from 2½ to 5¼ in., depending on the size of the casting. They also mention that the riser cross-sectional area should be from 60 to 80 per cent the cross-sectional area of the casting, but indicate that for light castings such as the one in question, risers 2 or 2½ in. in diam should suffice. On this basis we have developed the accompanying sketch for trial. As indicated the 2½-in. riser should not be more than 1 in. from the casting and should extend 2¼ in. below the bottom of the gate into the casting and at least 4 in. above the top of the casting.

Another possibility is use of the "Connor" or, as it sometimes is termed, the "kiss" gate. In this type of gating system the important feature is the width of the opening or connection between the riser block and the casting. It preferably should be 1/16 in. wide, but not over 3/32 in. The accompanying illustration gives our conception of that type of gating. Since the riser block is located in the upper portion of the



Two suggested gating procedures for eliminating shrinkage in chunky casting

drag, a partition or divider core containing a suitable opening is placed between the block and its extension to provide a small pouring basin. This step avoids direct pouring into the riser block and possible destructive action on the narrow slot gate.

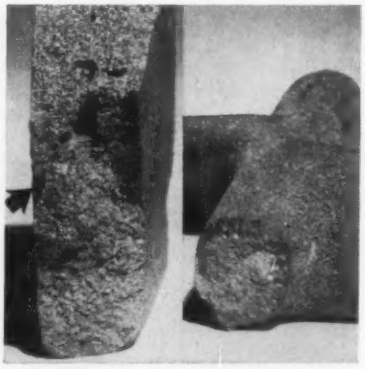
Different Defects Exhibited

We are sending for your consideration two samples of gray cast iron which show evidences of porosity. The smaller of the two (A) shows porosity at the gate and at a point opposite the gate which appears to be a type of metal-mold reaction. If the casting is fractured at any point along the section other than at the gate, the porosity is absent. We have noted that the porosity occurs only when the molten iron appears to be cold or "dead." With a live, hot iron (normal conditions) the castings are always sound. The other specimen (B) is a thin section broken from a heavier portion of a casting. The casting was poured on the cool side since the iron contains about 2.6 per cent silicon. Cooler metal was obtained by placing foundry scrap in the ladle and running hot iron from the cupola onto it. Could this procedure in itself cause the porosity? Here again this defect is not noted externally when the iron is hot. What is the best additive to be made in the ladle to prevent graphite precipitation in heavy sections, and what is the procedure for such addition?

Examination of the two specimens submitted indicates in our opinion different types of defects. The smaller of the two, or specimen *A* is typical of gassy metal which shows up as small pear-shaped holes just under the skin of the casting. That is confirmed by your statement that the trouble occurs when the metal appears "cold or dead" since that condition is indicative of improper melting conditions or improperly dried cupola spout or ladles. If the difficulty is encountered only at the start of pouring, there is a likelihood that it is caused by a wet spout or wet ladles. When it occurs after the heat has been in progress for some time, it probably is due to improper melting caused by the bed burning away, poor materials, etc.

It might be pointed out that our examination of fractures except close to the end differs with yours in that pinholes were present. We must admit that they were not nearly as prevalent as in the area around the gate. The reason for that is the rate of cooling or solidification. In the gate area the metal cooled slowly enough to permit the gases to move to the mold-metal interface where they formed bubbles which were trapped by the thin solidified skin of metal. In areas distant from the gate the rate of cooling was sufficiently fast to prevent movement of the gases.

Unfortunately the defect exhibited in specimen *B* is not so easy to pinpoint as that in specimen *A*, for it might result from either of two causes. If we are to assume from your statements that the defect occurs regularly in about the same position when cooled metal is poured into the casting, but does not show up when hot metal is used, we are inclined to believe that it is a shrink due to lack of feeding. The small opening leading to the surface is the result of sufficient vacuum created within the cavity to pull in the wall.



Left, shrinkage. Right, pinholes

Possibly this may be purely a gating problem which is aggravated by the use of cooler metal. You mention that the defect is not noted externally when hot metal is employed, and we suspect that if you fracture some of the "good" castings you probably will find evidence of shrinkage in the area.

We gather from your inquiry on prevention of graphite precipitation that most of your work is in lighter section castings for which relatively high silicon content of the iron is a necessity. In heavier section castings, that composition tends toward a coarse, open-grained structure which is undesirable. We believe that such condition can be remedied to an appreciable degree by the ladle addition of a carbide stabilizer such as chromium. You will have to experiment to determine the amount to be added per 100 lb of iron in the ladle which will produce the desired results.

According to available information, the chill-inducing effect of 1 part of chromium balances the chill-restraining of 1½ parts of silicon or 0.67 per cent Cr equals 1.0 per cent Si. For example, if you wanted to make a section which would require a silicon content of 2.20 per cent or 0.40 per cent less than that in your present iron, 0.40 x 0.67 or 0.27 per cent chromium would be required. Assuming that 70 per cent ferrochromium is to be used, 0.39 lb or 6¼ ounces per 100 lb iron would be required.

For ladle additions it is preferable to use a special grade of ferrochromium which contains about 64 per cent Cr and 5 per cent Si, and melts at a much lower temperature than the other grades. In that case 6¾ oz per 100 lb should be used in the previous example. The ferroalloy should be in crushed form 20 mesh and down. Iron should be hot, and the alloy added to the ladle after an inch or two of iron covers the bottom.

Abrasive Facing on Castings

We have orders for production of several sizes of cast aluminum alloy gratings which are required to have abrasive material imbedded in the exposed face. Can you give us information on the procedure?

Like a good many specialty operations, producing castings with abrasive material imbedded in the face requires some skill and experience. Essentially the procedure appears simple, but some experimental work is required to make satisfactory castings. The working face of the mold is sprayed with an adhesive, and then the abrasive grains are put in place. A wide variety of materials are used as adhesives and include a dilute solution of sodium silicate or waterglass, thin clay wash, molasses water, sulphite pitch solution, etc.

Abrasive material can be silicon carbide or aluminum oxide grit or grain which may range from 20 to 60 mesh depending upon the desired roughness or smothness of surface. The abrasive is applied to the sticky mold surface in a thin uniform layer by sifting through a screen of the same mesh size as the abrasive. Sometimes a second layer of abrasive is applied after spraying the first coat with the adhesive.

Mold face is torch dried to insure that the moisture is driven off.

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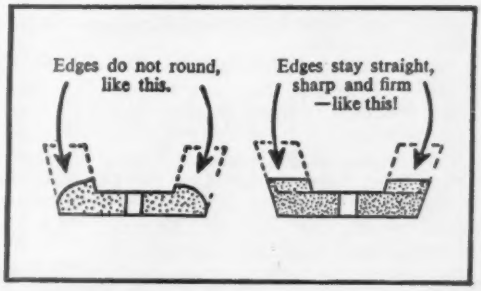

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● CLAUDE A. MARLOWE

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WILSON P. BURNS has been named manager of the Cleveland Works, National Malleable & Steel Castings Co., succeeding **Stewart Tame**, works manager since 1942, who has retired after 35 years with the company. **Lawrence G. Blackmon**, since 1952 superintendent of the finishing department at the Sharon, Pa., Works, has replaced Mr. Burns as general superintendent there.

Thomas M. Ware was recently elected president, International Minerals & Chemical Corp., Chicago, succeeding his father, **Louis Ware**, who has become chairman of the board. Thomas M. Ware was formerly administrative vice president, and since the retirement of **James P. Margeson** last year, he has had the additional duties of executive vice president.

C. F. Taplin Jr. has been elected vice president, general counsel, and assistant secretary, Wellman Bronze & Aluminum Co., Cleveland. **Frank H. Givler**, formerly head of F. H. Givler Co., has been named manager of the die division. **Eugene Kment**, until recently manager of the aluminum and magnesium division, A. C. Williams Co., Ravenna, Ohio, has been appointed assistant to the manager of Wellman's Peerless Plant in Cleveland.

Donald W. Smith has been appointed regional sales manager in the midwestern and southwestern states for Devcon Corp., Danvers, Mass.

● **Claude A. Marlowe** has been elected vice president, Treesdale Laboratories & Textile Processing Inc., Mars, Pa. He will continue as general manager, Pittsburgh Metals Purifying Co., Pittsburgh, subsidiary of Treesdale Laboratories.

Hans B. Missbach has been appointed supervisor-foundry laboratory operations, Applied Research and Development Laboratory, General Electric Co., Schenectady, N. Y. Mr. Missbach was associated with Sulzer Bros. Ltd., Winterthur, Switzerland, before joining GE's foundry department last year.

Dr. Kuang Lu Cheng has been appointed associate director of research and **Dr. Adolph E. Palty** supervisor of alloy development and evaluation, Utica Metals Div., Kelsey-Hayes Co., Detroit. Dr. Cheng was formerly associated with Materials Engineering Dept., Westinghouse Electric Corp., East Pittsburgh, Pa. Dr. Palty has been technical engineer in physical and mechanical metallurgy, Thomson Laboratory, General Electric Co., Lynn, Mass.

Henry D. Bryk has joined Rex Precision Products Inc., Culver City, Calif., as manager of engineering-quality control. He has been manager of operations, Alloy Precision Castings Corp., Cleveland.

Robert E. Carlson has been appointed sales supervisor in the Pittsburgh area, Coated Abrasives Div., Armour & Co., Alliance, Ohio.

● **Jack Bean, Harold Schroeder,** and **Philip G. Smith** have acquired Bay City Foundry Co., Bay City, Mich., which will continue under the same name. Mr. Bean is president, Mr. Schroeder, vice president, and Mr. Smith, secretary-treasurer. Mr. Bean was formerly president, and Mr. Schroeder, vice president, Michigan Standard Alloy Casting Co., Detroit. Mr. Smith is president, Electric Alloy Steel Co. and Philip G. Smith Co., both of Lincoln Park, Mich.

William M. Jackson, formerly plant manager, has been appointed general manager, Indiana Foundry Corp., Muncie, Ind. **Charles W. Tuttle**, vice president, has also been named vice president, G. M. Diehl Machine Works Inc., Wabash, Ind. **John A. Collinge** is president of both companies.

Robert Latham, since 1939 superintendent of the iron foundry, Bethlehem Steel Co., Bethlehem, Pa., has retired. **D. E. Best** has succeeded Mr. Latham, and will continue as superintendent of the brass foundry.

Curtis C. Drake, foundry engineer, is handling sale of nonferrous castings for Slack-Horner Brass Mfg. Co., Longmont, Colo. Mr. Drake retired last year as plant superintendent and sales representative, Griffin Wheel Co., Denver, which he had joined in 1916. He is a former chairman of the Rocky Mountain Chapter of the ASM and a former chairman of Timberline

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Circle 587 on Page 103

● J. SAMUEL ROBBINS
. . . operations v. p.

● ALBERT W. NORTON

● GEORGE F. ELLIOTT

● ANTHONY D. VITANTONIO

Muncie Malleable Foundry appointments

Chapter of the AFS. Mr. Drake has just completed a three-year term as a national director of AFS.

● **J. Samuel Robbins,** since 1953 Chicago district sales manager, Vulcan Mold & Iron Co., Latrobe, Pa., has been named vice president-operations. The company's Latrobe plant and the Chicago district plant in Lansing, Ill., will be under his direction.

Harley C. Lee, vice president and director, Basic Inc., Cleveland, was recently recipient of the Benjamin G. Lamme Medal of Ohio State University, in recognition of research and development work in the field of basic refractories. He was graduated from the university in 1927.

● **Fred C. Stockinger** has been appointed assistant sales manager, Bay State Abrasive Products Co., Westboro, Mass. **Robert F. Kelleher** has succeeded Mr. Stockinger as West Coast district manager. Mr. Kelleher was transferred from Detroit to West Coast sales in 1957. Appointments are effective September 1.

● **Albert W. Norton** has been appointed superintendent of foundry operations, Muncie Malleable Foundry Co., Muncie, Ind. **George F. Elliott** has been named chief inspector. **Anthony D. Vitantonio** has been made assistant superintendent.

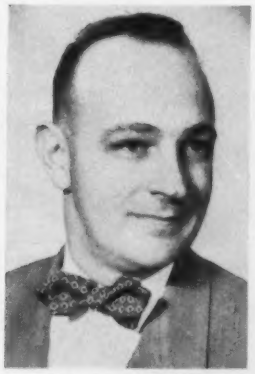
John J. Garrity has been named hoist district sales manger, Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, for northern California, northern Nevada, Utah, and Hawaii, with headquarters in San Leandro, Calif. Since 1954 he has been Detroit district sales representative for hoisting equipment.

● **R. J. Mulligan,** elected chairman of the Twin City Chapter of the American Foundrymen's Society for 1958-59, is supervisor of foundry research and development, Archer-Daniels-Midland Co., Minneapolis. He is a graduate of Western Reserve University. Mr. Mulligan was research director of the Foundry Products Division of the company in Cleveland prior to being named to his present position in Minneapolis.

D. C. Giles has been appointed manager of the new Pacific region recently established by Pure Carbonic Co. Div., Air Reduction Co., New York, to include Berkeley, Calif., Los Angeles, Portland, Oreg., and Seattle, Wash. He will make his headquarters in Berkeley. **D. B. Clapp Jr.,** formerly Los Angeles district sales manager, has been named regional sales manager there.

Clinton F. Kucera has been appointed New York district manager, Allis-Chalmers Mfg. Co., Milwaukee, succeeding **N. W. Landis,** who has been named manager of the Northeast region. Mr. Kucera, who joined the company in 1946, has been assistant manager of the New York district office since 1957.

● **Angus J. (Jack) Johnston,** for the last 25 years president of Hickman, Williams & Co., on July 1 completed 45 years with the company. A graduate of University of Wisconsin, he joined the company at Chicago as a salesman in 1913. In 1918 he was named Chicago resident manager, and in 1925 Chicago district sales manager. Mr. Johnston was made a

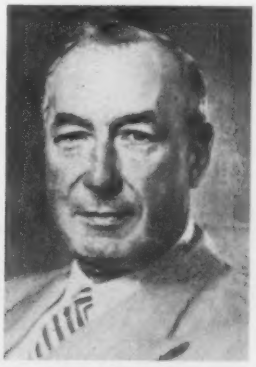


● FRED C. STOCKINGER

● ROBERT F. KELLEHER

Bay State Abrasive promotions

● R. J. MULLIGAN
. . . AFS Chapter chairman



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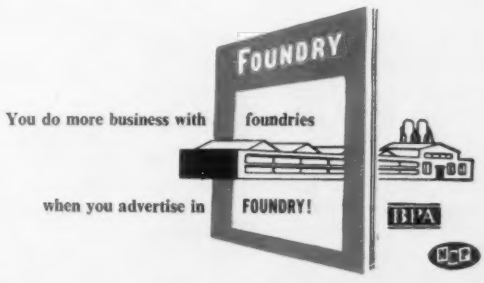

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● ROBERT M. BURNS
. . . heads Oregon Chapter

● W. W. HARRIS
. . . becomes marketing v. p.

● GERALD SCOTT
. . . foundry supplies sales

● L. J. WOEHLKE
. . . heads Wisconsin Chapter

company director in 1926, vice president in 1930, and has been president since 1933.

● **Robert M. Burns**, elected chairman of the Oregon Chapter of the American Foundrymen's Society, since 1956 has been vice president and manager, Light Metals Div., Pacific Chain & Mfg. Co., Portland, Oreg. A graduate of University of Washington, he joined Pacific Chain in 1947 and was a salesman in San Francisco until 1949, when he was named foundry manager in Portland.

J. F. Collins has been appointed assistant manager of the Pittsburgh region, Electro Metallurgical Co. Div., Union Carbide Corp., New York. He joined the company's Metals Research Laboratories in Niagara Falls, N. Y., after receiving a master's degree from Notre Dame University in 1948. Mr. Collins was transferred to the technical service and development department in 1952 and to the sales department in 1955.

Robert W. Bennett has been appointed field engineer in the St. Louis office, Norton Co., Worcester, Mass. He joined the company last year.

Carl H. Foltz Jr. has been appointed field engineer in the Chicago office, and **Thomas M. Hankin**, field engineer in the Atlanta office, Norton Co., Worcester, Mass.

Robert C. Hiltbrand has been appointed manager of export sales, Electric Furnace Co., Salem, Ohio. Since he joined the company in 1938 Mr. Hiltbrand has served in various departments, including mechanical engineering, field erection and the electrical and fuel divisions.

● **W. W. Harris** recently joined Roots-Connersville Blower Div., Dresser Industries Inc., Connersville, Ind., as vice president-marketing. Mr. Harris has been engaged in marketing management over 11 years, and was recently with General Electric Co. in Texas.

● **Gerald Scott** has been appointed Indiana representative, Delhi Foundry Sand Co., Cincinnati, with headquarters in Indianapolis. Mr. Scott was recipient of a Foundry Educational Foundation scholarship while attending University of Kentucky, and was employed in the university's foundry. Since graduation he has been associated with Buckeye Foundry Co., Cincinnati, specializing in development of the CO_2 Process.

Stephen E. Kelly, formerly assistant general manager, Eberhard Mfg. Co. Div., Eastern Malleable Iron Co., Cleveland, has joined Canton Malleable Iron Co., Canton, Ohio.

Walter S. Miller has been named president and a director, Commerce Engineering & Pattern Co., Walled Lake, Mich.

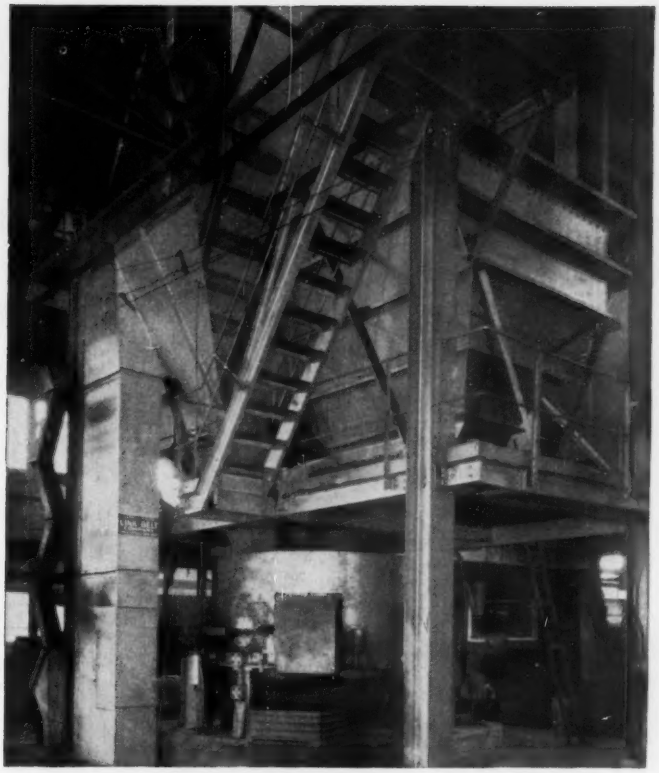
John M. Scott, formerly vice president and manager of industrial sales, Republic Coal & Coke Co., Chicago, has been elected executive vice president of the company.

George A. Lennox, since 1956 vice president-director of sales, Driver-Harris Co., Harrison, N. J., retired recently after 51 years with the company. He held office and sales positions prior to becoming western and New England district manager. In 1942 he was named general sales manager and in 1944, vice president-general sales manager.

● **L. J. Woehlke**, elected president of the Wisconsin Chapter of the AFS for 1958-59, is plant manager, Spring City Div., Grede Foundries Inc., Waukesha, Wis. He was graduated from Purdue University and joined Grede Foundries as a trainee in 1946. Mr. Woehlke has been active in work committee of the Gray Iron Research Institute and is currently serving as vice chairman of its operator's group.

Louis F. Prossen has been appointed manufacturing and development engineer in the Buffalo plant, Niagara Blower Co., New York. **William R. Hollinger** has been named application and sales engineer, Philadelphia. **Tom L. Larson** will represent the company as district engineer in Baltimore and Washington.

A. O. Schaefer, president, Pencoyd Steel & Forge Corp., Philadelphia, has been appointed to fill the unexpired term of secretary, American Society for Metals, formerly held by the late W. H. Eisenman. A former president of the society, Mr. Schaefer will serve until the end of October 1958. **Ray T. Bayless**, assistant secretary of the society, has been appointed manager pro tem, a position also formerly held by Mr. Eisenman. Officers nominated to serve the society for 1958-59 are as follows: **C. H. Lorig**, technical director, Battelle Memorial Institute, Columbus, Ohio, president; **Walter Crafts**, associate director of research, Metals Research Laboratories, Electro Metallurgical Co., Niagara Falls, N. Y., vice president; **Walter E. Jominy**, recently chief metallurgist, research, Chrysler Corp., Detroit, secretary; **M. A. Scheil**, A. O. Smith Corp., Milwaukee, and **Earl R. Parker**, University of California, Berkeley, trustees.



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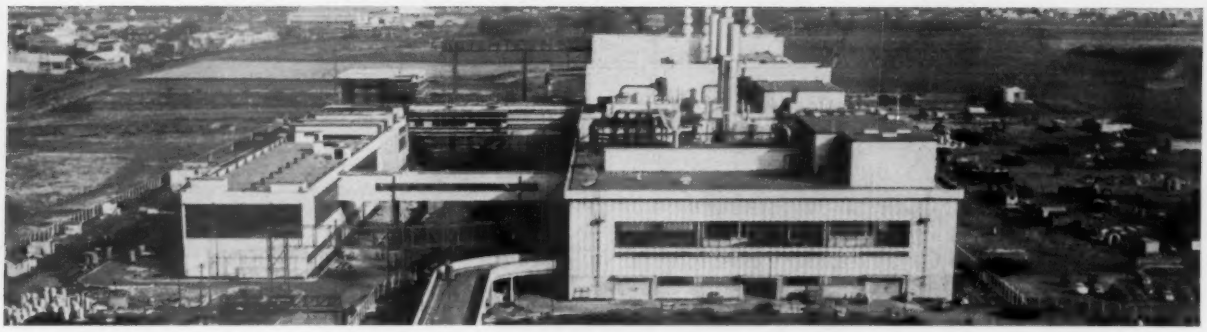


The new Thames Foundry of Ford Motor Co. Ltd. at Dagenham, Essex, England. Building at the right, nearly a quarter mile long, houses the main operations

Ford's New Thames Foundry Sets High Standard in Design

EXTENSIVE mechanization and superior working conditions have doubled previous casting production per manhour at a new foundry completed recently at Dagenham, Essex, England, by Ford Motor Co. Ltd. The plant has a daily capacity of 400 tons of finished castings and was built at a cost of more than $20 million. Employment totals 1800 persons.

For the most part, casting production consists of cylinder blocks, heads, and large tractor components. Remaining Ford requirements are supplied by the company's older Dagenham foundry and by another at Leamington. Ouput per manhour of the types of castings produced at the new plant is said to be twice that achieved previously.

The new foundry includes two buildings with a total floor space of 533,000 sq ft. The main building is 1200 ft long by 180 ft wide and 70 ft high. Its two stories contain melting, molding, coremaking, and some cleaning operations. The second building, 700 by 60 by 70 ft, contains the sand handling and drying, casting cooling, grinding, and cleaning sections. Five substations on the roof of the main building distribute 15,000 kva of electrical power, a figure indicative of the plant's high degree of mechanization.

Melting — Skip-hoist machines load preweighed charges into four 108-in. diam, hot-blast, watercooled cupolas, two of which are operated per shift. An 8-ton metal receiver on each cupola pours hot metal into ladles suspended from electric towing and hoisting units on monorails. A pig-cast machine with 20-ton capacity per hour pigs surplus metal.

Semiautomatic Molding — Two molding lines, fully equipped with smoke and fume collection apparatus, are fed from automatic sand systems. Each line includes eight semiautomatic molding machines working within a continuous 800-ft mold conveyor of modern pallet design. Sand for each line is mixed in four 50-ton-per-hour mullers. A slurry plant at a central station pumps seacoal and bentonite to each muller in slurry form.

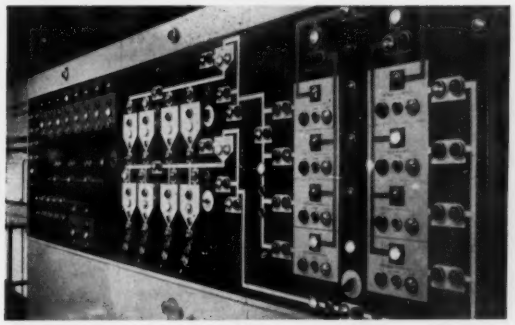
After molds have been poured, castings are removed from the drag by hook carriers suspended from a monorail cooling conveyor above each mold conveyor. This conveyor delivers them to the auxiliary building. They cool for approximately three hours before sand and cores are removed by vibrators and then are passed through a battery of 13 flash-grinding machines. Two monorail conveyors next return castings to the main building for subsequent cleaning and finishing operations and, where it is required, for water testing. Castings then are ready for the machine shop.

Coremaking — Cores are formed and baked at least 24 hours before they are used in molds. The core shop is centrally situated in the main building so that it can supply cores for either molding line conveniently as required.

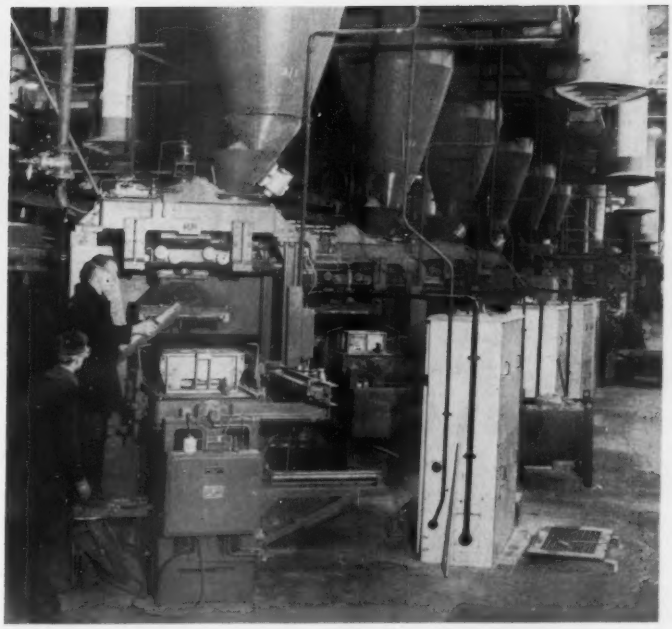
Core sand is mixed automatically at a central, high-level station. The mixing operation is actuated by insertion of a punched card—one for each type of sand mix—into the weighing system. Mixed sand is conveyed to coreblowers by two pneumatic systems, reportedly the only ones of their kind outside the U. S. A.

All cores are produced on 39 semiautomatic vertical coreblowers. Blown cores move by conveyor to five continuous horizontal ovens for baking. The ovens are elevated to facilitate operations and to provide storage space beneath. After baking, cores are coated with a wash and are dried in three horizontal core-wash drying ovens. Nine core-grinder machines remove any surplus sand.

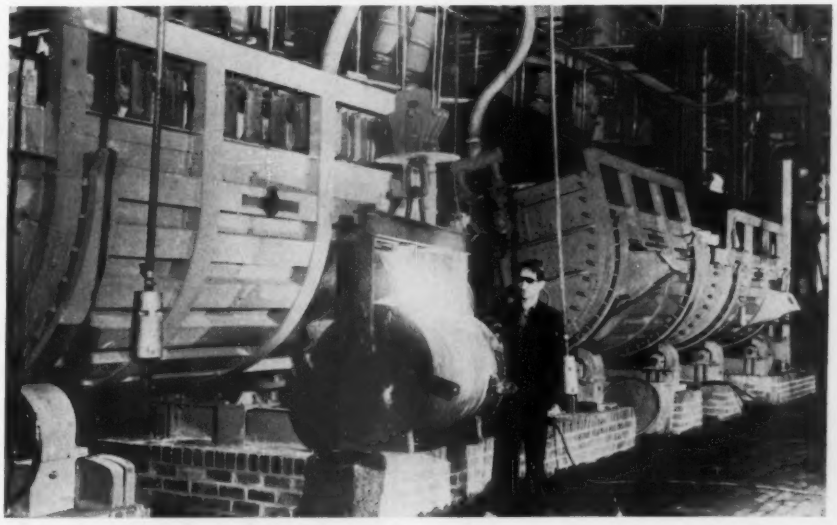
Working Conditions — Achievement of the best possible working conditions was a major goal of the new foundry's designers. A heating, ventilating, and air purifying system warms the plant and changes the entire air content more than seven times an hour. In the molding and cleaning departments, air changes are as frequent as 16 times an hour. All entering air is cleaned, warmed in winter (by about 100,000,000 Btu of heat per hour on cold days), and fan cooled in summer. Steam heat-



Pushbutton system controls sand handling from receipt at plant to ultimate usage

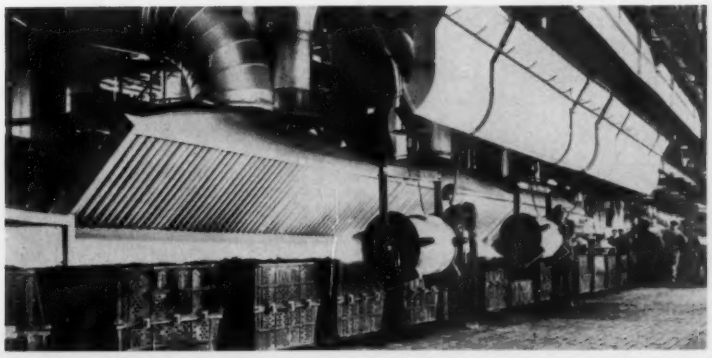


Coremaking line includes six core blowing and core stripping machines. Four of these units are completely automatic

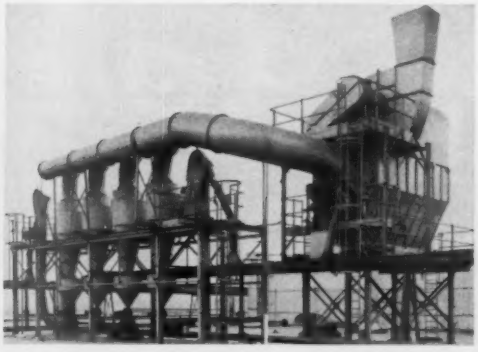


Four hot-blast cupolas of 108-in. diam are tapped into 8-ton capacity hot metal receivers. Here hot metal is being transferred into a 2000-lb pouring ladle

Pouring heavy castings on one of the two lines at the new foundry. Exhaust system removes smoke and fumes



One of a number of dust collection units which help to provide favorable operating conditions



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ers around the perimeter of the building and over main aisles and doorways compensate for heat losses. Windows and fans are thermostatically controlled to allow for temperature variations.

Dust extraction systems collect dust at the source and deliver it by ductwork to wet-type separators. A sluicing system receives the resulting slurry together with slag from the cupolas and carries both to settling tanks and ponds. The water is returned for recirculation.

Facilities for the convenience of workers include a kitchen and cafeteria which accommodates 700 men at a sitting and serves hot meals. Each man has a heated twin locker, one part of which is for his working clothes and the other for his street clothes; showers also have been provided. In the plant itself, heavy manual work has been eliminated wherever possible and mechanical handling equipment installed.

Gray Iron Founders' Society Holds Management Meetings

Representatives from more than 150 foundries from coast-to-coast attended a series of four regional management meetings conducted recently by the Gray Iron Founders' Society.

The president of GIFS, J. Scott Parrish, Jr., president, Richmond Foundry & Mfg. Co., Richmond, Va., and the headquarters' staff executives were featured speakers at the business sessions, which were held in Monterey, Calif.; Waukegan, Ill.; Ft. Wayne, Ind.; and Pottstown, Pa.

President Parrish highlighted the significance of the society's major programs in his talks and emphasized the advantages and importance of foundrymen's working together for the over-all good of the industry.

Donald H. Workman, executive vice president of the society, explained how the industry's trade association activities have helped members to improve profitable sales.

"Quality and Cost Control Through Engineering" was discussed at the meetings by Charles F. Walton, GIFS technical director and editor of the *Gray Iron Castings Handbook*. Mr. Walton particularly emphasized the importance of proper utilization of technical personnel in achieving quality and cost controls. At the Pottstown meeting R. C. Meloy, marketing director, spoke on "Selling More Castings Profitably."

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ARE SPECIALLY RECOMMENDED
Threaded Stems 20 ga. to 1/4" Dia. 3/16" to 1" High
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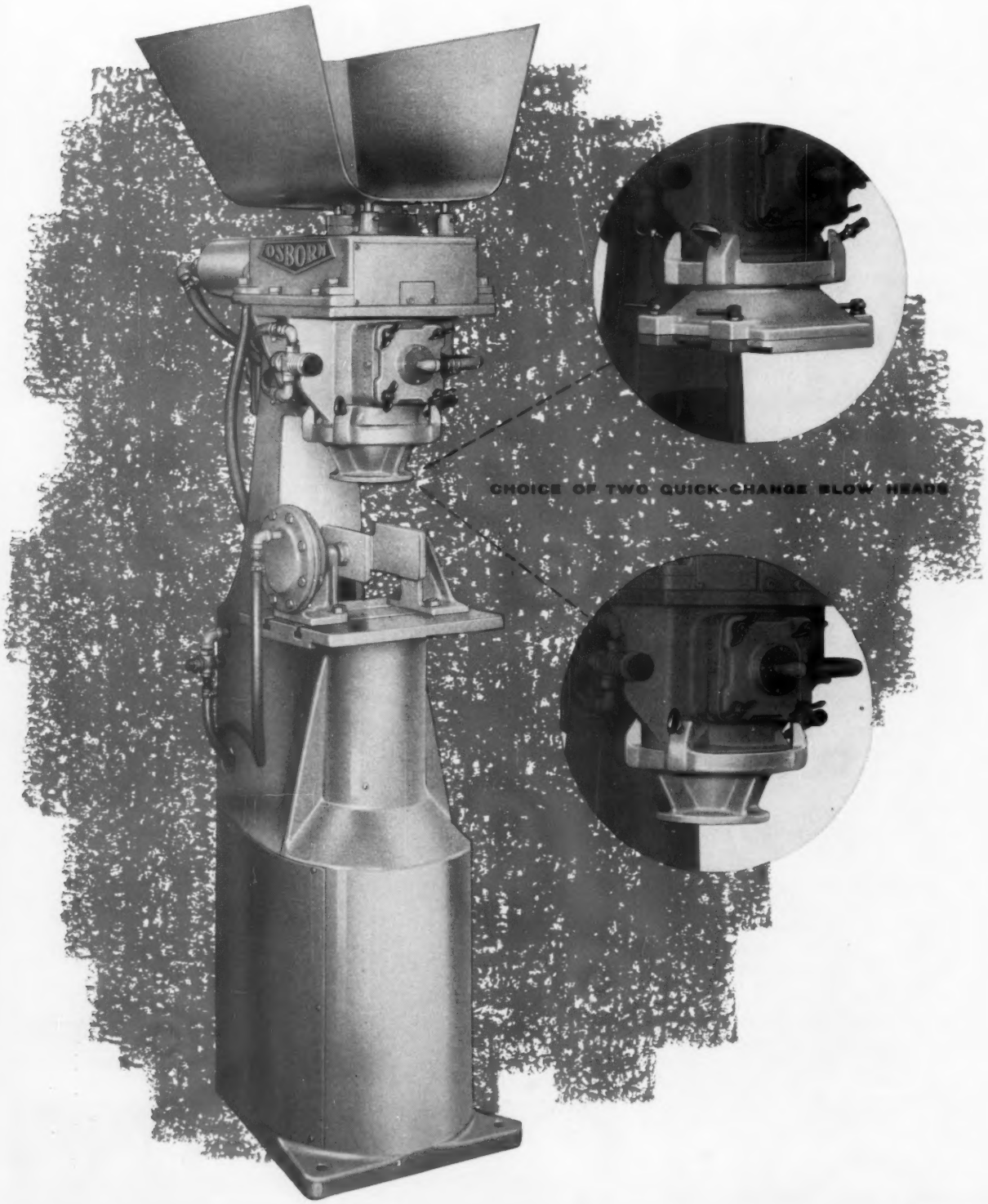

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AUTOMATIC CORE BLOWER

for low-cost, high production of quality small cores

Newest equipment development in Osborn's famous line of foundry production machinery is the Osborn JET-CORE Automatic Core Blower.

Designed for use in production, semi-production or jobbing foundries, the JET-CORE produces quality cores at extremely low cost . . . automatically . . . at high production rates.

Write us for full details on the new JET-CORE and how it can help you trim costs and boost foundry profits. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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- Automatic, single push-button operation.
- High-speed machine cycle time.
- Improved jet action blow.
- Choice of quick-change blow heads speeds setup time—standard head with quick-change blow plate . . . funnel head for jet blow.
- Stationary head . . . no reservoir movement for filling.
- Core-Blower table adjusts and locks hydraulically.
- Unit is exceptionally compact.
- Designed to deliver highest quality cores faster . . . at low cost.

leader in mechanization for the foundry OSBORN®

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SAVE WITH THESE STOCK SIZES:

P.P. Inc. No.	Dia.	Thick-ness	No. of Holes	Hole Dia.
1-CAA	1"	5/16"	3	1/8"
175-EED	1¾"	3/8"	7	1/4"
175-GHD	1¾"	7/16"	10	1/4"
175-GFD	1¾"	7/16"	8	1/4"
2-IGD	2"	1/2"	9	1/4"
2-EHD	2"	3/8"	10	1/4"
213-GGD	2⅛"	7/16"	9	1/4"
225-EFF	2¼"	3/8"	8	5/16"
225-ENC	2¼"	3/8"	16	7/32"
25-END	2½"	3/8"	16	1/4"
275-GRD	2¾"	7/16"	19	1/4"
3-INF	3"	1/2"	16	5/16"
3-GPF	3"	7/16"	18	5/16"
35-GRF	3½"	7/16"	19	5/16"
35-GRH	3½"	7/16"	19	3/8"
35-INH	3½"	1/2"	16	3/8"

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Alloy Casting Institute Holds Its 18th Annual Meeting

A capital goods expansion by the early 1960s and a doubling of labor costs by 1970 were predicted at the 18th annual meeting of the Alloy Casting Institute at Hot Springs, Va., June 23-24.

Speaking before the producers of stainless steel and high alloy castings, Lester B. Knight, president, Lester B. Knight & Associates, Chicago, and E. Russell Eggers, economist of the McGraw-Hill Publishing Co., New York, emphasized that the foundry industry must take advantage of the present business recession to prepare for the predicted upswing in capital goods production.

PAUL L. McCULLOCH JR.
President

At the election of new officers of the institute, for the coming year, Paul L. McCulloch Jr., president, Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio, was named president. Mr. McCulloch began his business career with American Manganese Steel Div. of Brake Shoe in 1945. In 1947, he became sales engineer for this division and Electro-Alloys Div., and in 1953 was appointed sales manager of the latter.

Elected vice president was J. B. Dear, general sales manager, Duraloy Co., Scottdale, Pa.

Two new members were named to the institute's board of directors. They are E. H. Platz Jr., Lebanon Steel Foundry, Lebanon, Pa., and J. S. Wooters, General Alloys Co., Boston. E. A. Schoefer, Mineola, N. Y., was re-elected executive vice president and treasurer of the institute.

In a talk entitled "Prepare Now for Future Growth of the High Alloy Foundry Industry," Mr. Knight pointed out that the current "labor dollar" is 35 to 42 per cent of the "cost dollar." This amounts to about $4500 to $6500 per year per worker, depending on fringe benefits and other variables. By 1970, this figure will skyrocket to about $10,000 per worker per year.

To prepare for this situation, Mr. Knight urged the foundrymen to use the present business lull activity to make their operations more efficient at every stage of production. Specifically, he suggested that a "soul-searching" analysis be made to determine where labor saving techniques and equipment could be installed—with the total effect of substantially increasing productivity per manhour.

Mr. Eggers said that alloy casting producers have an especially good original equipment market potential in the next few years in the chemical processing and defense industries, although the present trend of limiting spending to modernization and replacement will continue in many industries. The early 1960's should see a wave of new capital goods spending to take care of the equipment required for new processes that are now being developed.

Bibliography Covers Cobalt

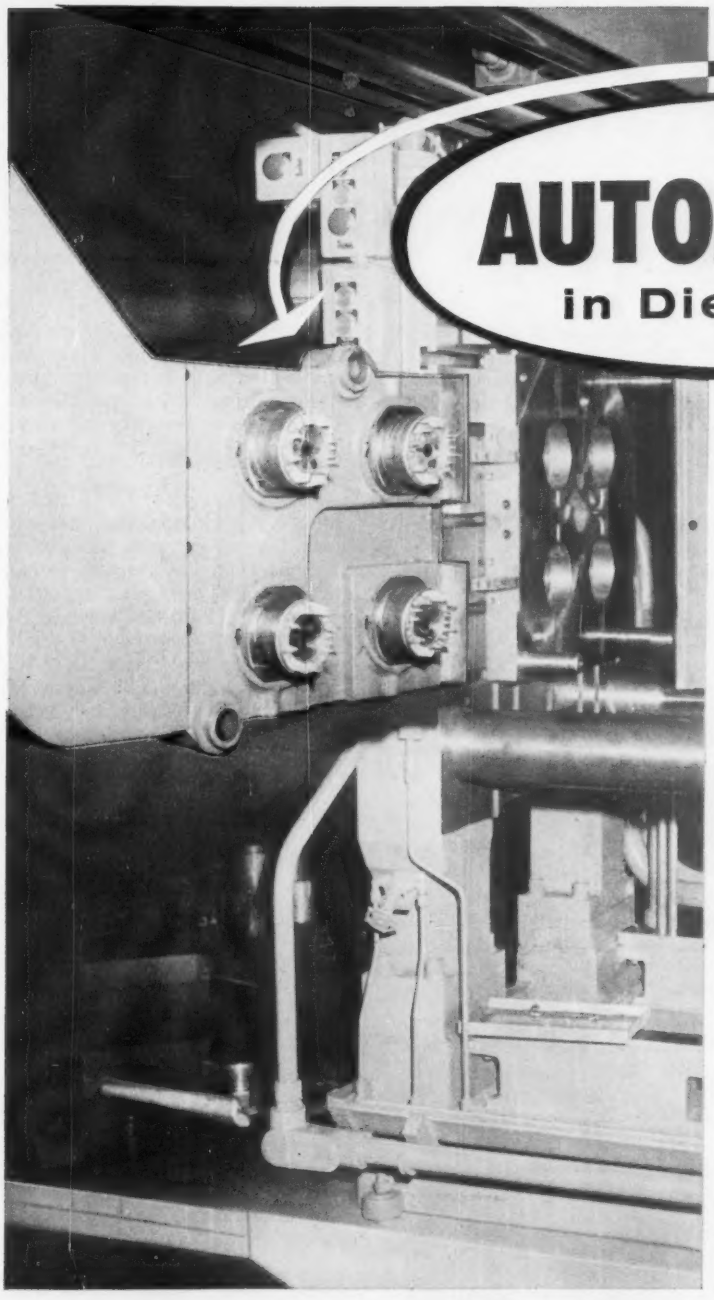
A revised, bound edition of the bibliography "Cobalt and Its Alloys" is available from the Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio. By Dr. F. R. Morral, the 125-page reference work presents a summary of allotropy and phase diagrams.

The section on allotropy contains more than 90 references to literature from 1911 to 1958. Two-color phase diagrams for the cobalt binary alloys are included as well as more than 900 references to binary, ternary, and quarternary systems.

Copies may be obtained by addressing the Cobalt Center on company letterhead. Interested persons overseas may obtain copies from the Centre d'Information du Cobalt, 35, rue des Colonies, Brussels, Belgium.

Celebrates 25th Anniversary

An awards banquet recently marked the 25th anniversary of W. O. Larson Foundry Co., Grafton, Ohio. Seven employees, each with the full 25 years of service, were honored, as well as four others with long employment. Founded by the late W. O. Larson, the company began operations in 1933. W. O. Larson Jr. is president.



AUTOMATION
in Die Casting

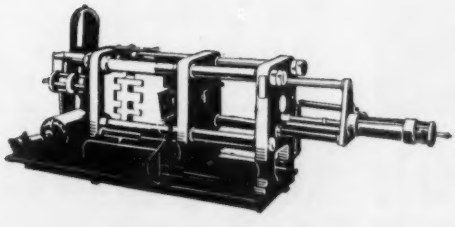
NEW! MULTIPLE CAVITY LOADER-UNLOADER

- Loads Laminations • Die Casts
- Trims • Unloads 4 rotors automatically

Another illustration of the pace-setting advances that are coming from Cast-Master! A major motor manufacturer gave Cast-Master the job of stepping up production and reducing labor on die-casting laminated rotors. Cast-Master solved the problem with this new, automatic loader-unloader. "Hydraulic muscles" load, trim, press out dummy shafts, unload automatically — cut costs while maintaining uniform quality. **One more example of the skill and know-how at your disposal when you turn your problems over to Cast-Master.**

FULLY DETAILED BROCHURE

Just off the press. Illustrated brochure giving complete details on this new CAST-MASTER loader-unloader. Phone, write or wire, and we'll get a copy to you at once.



Midwest Rep. C. W. Stone Co., Minneapolis, Minnesota
Eastern Rep. Milton Harmon, 223 Pine Tree Drive, Orange, Connecticut
Western Rep. Sydney J. Wills, 2120 Strand, Hermosa Beach, California
Central-West Rep. Earl L. Johnson, 1696 Webster Lane, Des Plaines, Illinois

CAST-MASTER *Inc.*

23901 AURORA RD.
BEDFORD, OHIO

Circle 594 on Page 103

Industry Briefs

BEARDSLEY & PIPER, division of Pettibone Mulliken Corp., Chicago, has acquired from Archer-Daniels-Midland Co., Cleveland, the complete line of equipment formerly manufactured by the latter's San-Blo Dept. The products include core and mold blowers, core rollover draw units, core sand mixers, wire straighteners and cutters, and core draw units. These units and all repair and replacement parts will be manufactured and sold by Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.

Tamms Industries Co. has moved into a new 40,000-sq-ft plant on U. S. Highway 66, south of 47th Street in McCook, Ill., a Chicago suburb. The plant will be used to manufacture Tamms products and to warehouse items produced at other points and distributed in the Chicago area. It includes a research and development laboratory. General offices of the company are situated at 228 N. LaSalle St., Chicago 1, Ill.

Sorbo-Mat Process Engineers, St. Louis, have licensed the foundries of J. I. Case Co. at Rockford, Ill., and Racine, Wis., to manufacture Sorbo-Mat controlled specification cast metals. Both foundries are being modernized and expanded under the guidance of Foundry Design Co., St. Louis.

Nuclear Corp. of America, New York, has appointed the Whiting Corp., Harvey, Ill., as exclusive sales agent in the foundry industry for its electronic device for determining the stock line in cupolas. The instrument employs gamma rays and Geiger counters for its operation.

Western Foundry Co., Tyler, Tex., has completed license agreements for the use of its centrifugal process for the production of soil pipe with Talleres Industriales S. A. Monterrey, Mexico, and A/S Dansk Rrindustri, Frederica, Denmark.

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., through action of stockholders, has approved of the company's sale to Textron Inc., Providence, R. I. The company will operate as a division of Textron, with Dale Mitchell continuing as executive head.

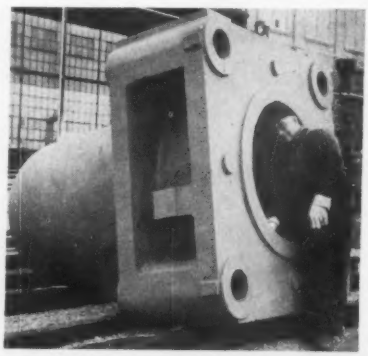
Houghton Laboratories, Olean, N. Y., manufacturer of epoxy plastics, has formed a new division, Hysol of California, with plant and offices in a new building at 1706 North Potrero, El Monte. Lloyd M. Dixon is vice president and general manager of the division.

International Minerals & Chemical Corp. has moved to a new administrative center in Skokie, Ill., 17 miles from downtown Chicago. All divisions of the corporation will have the new address: Old Orchard Road, Skokie, Ill.

F. E. (North America) Ltd., foundry equipment manufacturer, has moved to new headquarters at 47 Advance Rd., Toronto 18, Ont. New phone number is Belmont 3-3227.

Claud S. Gordon Co., Chicago, instrument manufacturer, has been acquired by Cleveland Pneumatic Industries Inc., Cleveland, and will be operated as a subsidiary.

United States Rubber Co., New York, has appointed Machinery & Supplies Co., 2000 Walnut St., Kansas City, Mo., to distribute its conveyor belting, transmission belting, rod and sheet packing, all types of hose, and other industrial rubber products.



This 34,200-lb ductile iron casting is designed to withstand pressures up to 2500 psi. Poured without risers at Cooper-Bessemer Corp., Mount Vernon, Ohio, it is a basic component for a 1500-ton capacity hydraulic press with 60-in. stroke cylinder

Reynolds Metals Co., Richmond, Va., has named Sonken-Galamba Corp. to distribute its aluminum pig and alloy ingot. Sonken-Galamba has warehouses in Kansas City, Kans., North Miami, Fla., and Gardena, Calif.

Budd Co., Philadelphia, has established a western sales office with headquarters in Los Angeles to coordinate West Coast sales activities for two subsidiaries, Continental-Diamond Fibre Corp. and Tatnall Measuring Systems Co., and for its Defense Div. and Nuclear Systems Div. Edwin R. Wisner has been appointed director of the new department.

Corning Glass Works has consolidated its refractory sales, product promotion, and product engineering departments and those of its wholly owned subsidiary, Corhart Refractories Co., Louisville.

Ampco Metal Inc., Milwaukee, and Sarazin & Cie, Neuilly-sur-Seine, France, have concluded a licensee arrangement for the exclusive manufacture in France of Ampco-Trode covered electrodes, filler rod, and spooled wire, to be sold under Ampco's tradenames. Ampco also has licensed Canadian Bronze Co., Montreal, to pour Ampco Metal and to distribute the firm's raw material products.

Great Lakes Foundry Sand Co., Detroit, has moved its business office from the United Artists Building to 1217 Francis Palms Bldg., Detroit 1, Mich.

McMinnville Castings Co. will open a plant in McMinnville, Tenn., late this summer to manufacture machine tool parts. An 18,000-sq-ft structure is being built to house the company. Employment will total up to 100 persons.

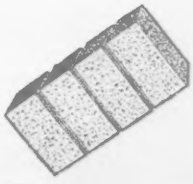
Air Reduction Sales Co. recently dedicated a new $9 million plant at South Acton, Mass., near Boston, for

are you interested in the profit potential of cleaner iron?

Then You'll ALWAYS USE *Famous* CORNELL CUPOLA FLUX

don't accept substitutes

A little Famous Cornell Cupola Flux, added to each cupola charge of iron, purges molten iron of impurities so that you pour clean metal every time. Furthermore, the iron is hotter and more fluid, and sulphur is greatly reduced. Many dollars are saved in cupola maintenance, too. Digging out is greatly reduced as drops are cleaner and bridging over is practically eliminated.



The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Circle 595 on Page 103

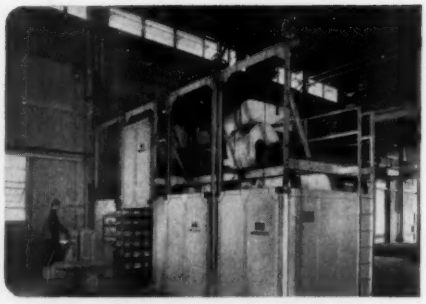
the starting point

for better castings at lower cost...

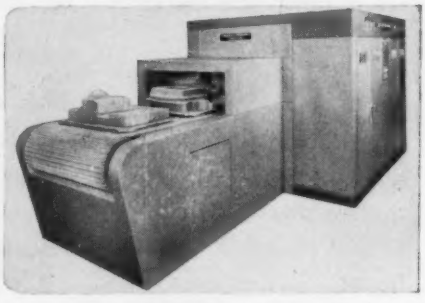
COLEMAN OVENS

The only complete line of Core and Mold Ovens made in every type for every method to fit YOUR requirements BEST!

Coleman Tower® Oven



Coleman Transrack Ovens



Coleman Dielectric Core Oven

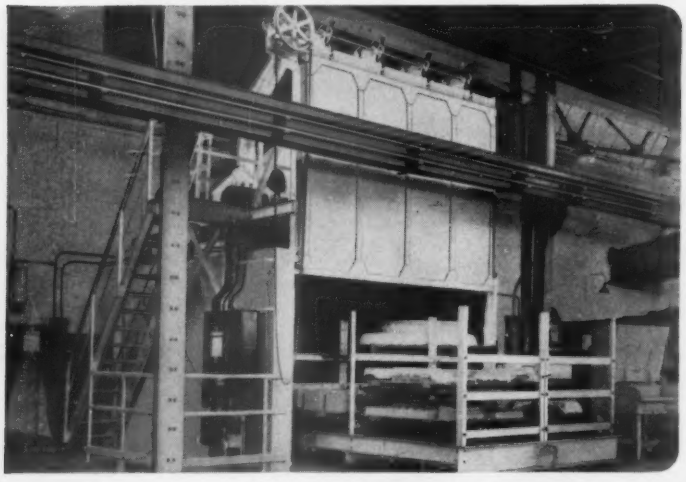
For better quality castings... for immediate savings in labor, materials and fuel, for consistently uniform baking of cores and molds at lower cost, install Coleman Ovens. Large and small foundries find Coleman Ovens are essential in producing castings to meet the most exacting specifications.

Performance records prove that Coleman Ovens may reduce overall core department costs by as much as 50%. Such savings mean increased profits and rapid amortization of the oven cost. Many Coleman Ovens have paid for themselves in less than a year!

Coleman Core and Mold Ovens provide exclusive features resulting from over 50 years of specialization in the design and construction of foundry ovens and over 10,000 installations in leading foundries. *As builders of the world's only complete line of foundry ovens, we have no reason to recommend any but the oven best suited to your requirements.*

Experienced Coleman Engineers are ready to help you with your foundry oven needs without obligation. Now, with production savings so important it will pay you to investigate the unusual advantages of Coleman Ovens.

Write today for Bulletin 54



Coleman Car-Type Oven

A COMPLETE RANGE OF TYPES AND SIZES...

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

the production of liquid oxygen, nitrogen, and argon. It is the fifth facility of this type to be built by the company in recent years.

Hevi-Duty Electric Co., Milwaukee, has added fuel-fired heat treating, forging, and melting furnaces to its line of electric heat treating furnaces through acquisition of the furnace business of Eclipse Fuel Engineering Co., Rockford, Ill. In addition to producing new furnaces, Hevi-Duty will maintain sales and engineering records on all furnaces previously produced by Eclipse and will supply service and replacement parts.

Pittsburgh Metals Purifying Co., division of Treesdale Laboratories, Mars, Pa., has established manufacturing facilities in Sao Paulo, Brazil. The new company will be known as Industrial E. Comercial Ltd.

American Foundry Flask Co., Kansas City, Mo., has appointed the John A. Sharritts Co., Lakewood, Ohio, as sales representative in Cleveland, most other parts of Ohio, and western Pennsylvania.

Taylor-Westerfield Inc. is the new sales representative in the Youngstown, Ohio, area for the air and hydraulic valves and cylinders of the Galland-Henning Nopak Div., Milwaukee.

Erickson Power Lift Trucks Inc., 211 St. Anthony Blvd., Minneapolis, Minn., has been admitted as a member of the Material Handling Institute in the Gas Truck Product Section.

Edward Barnes Cast Products Co. has opened manufacturing facilities at 12412 Hempstead Rd., Houston, Tex., and will produce letters, plaques, and nameplates in aluminum and bronze.

Lindberg Steel Treating Co., Melrose Park, Ill., has acquired the processing facilities of the flame hardening department of Metal Improvement Co., Los Angeles. These facilities have been integrated with those of the selective heating division of Lindberg's branch in Los Angeles.

Louis Allis Co., Milwaukee, has completed a district office and warehouse building at 4405 E. Olympic Blvd., Los Angeles, Calif. It will stock a complete line of the firm's standard and special motors.

Multiple Corp., Dayton, Ohio, has transferred the manufacture and sales activities of the Multi-Pul unit to the Indus Corp., 1815 Madison Ave., Indianapolis 25, Ind.

Laboratory Equipment Corp. has completed an addition to its St. Joseph, Mich., plant which will house research and manufacturing facilities.

SEE COATED ABRASIVE MACHINES

Thousands visit third national exhibit

Visitors from the USA and many foreign nations saw and tested new abrasive machines at the third National Coated Abrasive Machinery Show at Troy, N. Y.

THE growing importance of coated abrasives as a basic industrial tool was emphasized at Troy, N. Y., June 9-13 when 150 new abrasive machines were viewed and tested by several thousand industrial production men from all parts of the United States and half a dozen foreign countries.

The occasion was the third National Coated Abrasive Machinery Show, sponsored by Behr-Manning Co., a division of Norton Co., at its new $1 million Product Engineering building. The abrasive manufacturer acted as host to the machinery industry, inviting machine manufacturers to demonstrate developments of the past two years.

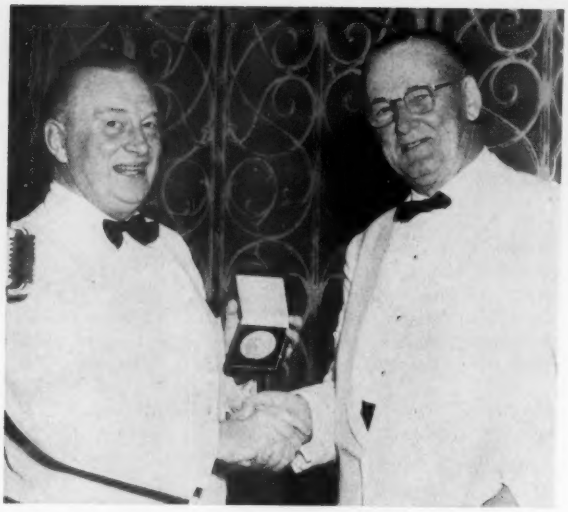
Production men from all phases of the metalworking, woodworking, furniture, plastics, and other industries brought actual workpieces, using them to subject the new machines to comparative testing of their grinding and polishing performance. Among show visitors were large groups of supervisory men from grinding and polishing departments of large automobile manufacturers, aircraft firms, government arsenals, and other metalworking organizations.

Among significant advances in machine tool design, particularly among machines whose weight was measured in tons, was a conspicuous "beefing up" of frames, bearings, and drive trains to keep pace with improvements in abrasive belts and with the increasing forces being exerted in heavy stock removal, descaling, and similar work. More attention was also paid to flooding the work areas with coolants, and to more thorough filtration to remove grinding swarf and other contaminants from the coolant flow—a benefit where close tolerances must be held in producing low microinch finishes.

Features included a 150-hp grinder using a 50-in.-wide abrasive belt for mechanical descaling and heavy stock removal; a 40-ft longitudinal polisher for tube, bar, and extruded sections; an 11½-ton woodworking sander which dimensions and finishes in a single pass; a centerless grinder with fully automatic gaging; and a rubber roll grinder able to hold 0.001-in. tolerances on rolls of face widths up to 80 in. Also demonstrated were a 1000-gallon subfloor filtration unit with an automatic elevator to deposit wastes in a disposal tank, efficient new dust-collection systems, and a belt storage room held to ideal conditions of temperature and humidity.

Dirck Olton is manager of the Product Engineering Department which developed the show. John J. Durnan was show manager.

P. C. DeBruyne, right, passes MFS president's rammer to his successor, Richard W. Crannell



Collins Carter, left, presenting society's Charles H. McCrea Medal to James H. Smith

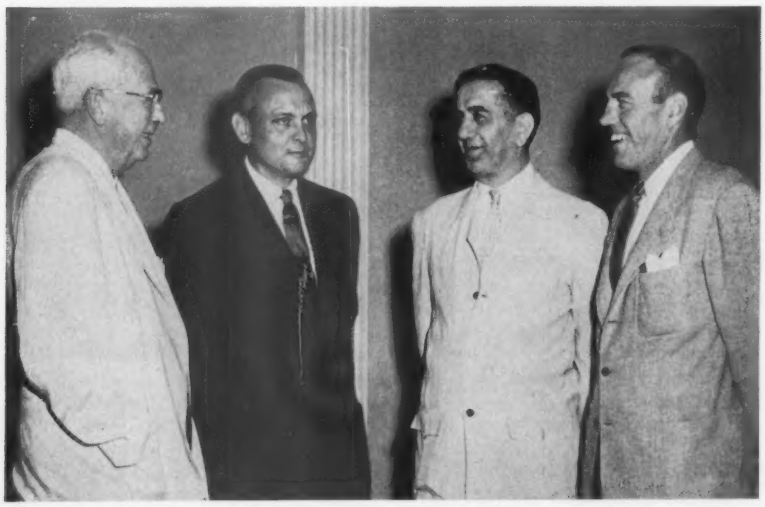
Malleable Founders To Stress

MARKETING ACTIVITIES

By **WILLIAM G. GUDE**
Managing Editor

GOOD progress during the past year in the market development, research, and other activities of the Malleable Founders' Society was reported at the annual meeting held June 9-10 at the Homestead, Hot Springs, Va.

The general subject of marketing, including public relations and advertising, will receive the society's concentrated attention during the coming year, it was indicated by President-elect Richard W. Crannell. Mr. Crannell, president, Lehigh Foundries Co. Div. of Lehigh Inc., Easton, Pa., was named to succeed Philip C. DeBruyne, vice president, Moline Malleable Iron Co., St. Charles, Ill. Dudley V. Walker, managing directer, Eberhard Mfg. Co. Div., and vice president of Eastern Malleable Iron Co., Cleveland, was elected vice president.



New vice president, Dudley V. Walker, left, and three new directors at annual meeting—T. T. Lloyd, Joseph Abusamra, R. S. Bradshaw Jr.

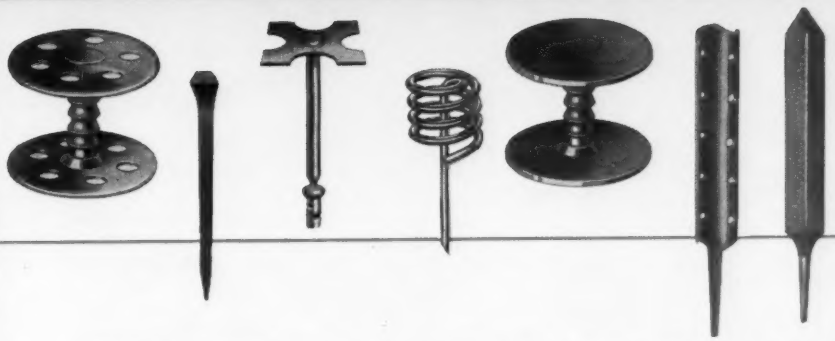
In the president's report, Mr. DeBruyne pointed to accomplishments in the research program, particularly in studies of machining characteristics of malleable iron and the behavior of malleable iron at elevated temperature. Other work referred to concerned the new edition of the society's handbook, the market development program, and work in the accounting and personnel relations fields.

Reporting for the Research and Technical Council, Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis., discussed the studies on atmospheric corrosion, machining, and elevated-temperature properties of malleable iron and mentioned several tentative topics for investigation. The latter include freezing of white iron, straightening, and hot tearing. The council plans to continue its highly successful Technical and Operating Conferences.

Activities of other committees were reported by the following: Personnel Relations — Joseph Abu-

FANNER brings your casting problems DOWN TO WORTH!

the most complete line of CHAPLETS and CHILLS to improve casting quality



a National Network of fine FANNER REPRESENTATIVES to provide on the spot service

To get the "most for your money", you need BOTH — the BEST product and the BEST service. In fine FANNER Chaplets and Chills scientific engineering and precision manufacturing combine with dependable service to keep the cost of your castings down and your production "on-the-go".

The exclusive design features and special metal formulas of fine FANNER Chaplets and Chills are the key to the production of sounder castings. In the wide range of our chaplets and chills you are sure to find the best product for your needs. Write for the FANNER Chaplet and Chill catalogs.

In every major foundry market there is an experienced FANNER representative who will provide you with quick, efficient service on regular or emergency requirements. Listed are the many organizations handling FANNER foundry products — call on them. They are as close as your telephone and can help you.

THESE FINE FANNER REPRESENTATIVES ARE AT YOUR SERVICE!

ALABAMA

Hill & Griffith Co.
P. O. Box 1232
Birmingham 1, Alabama

CALIFORNIA

Barker Foundry Supply Co.
4887 Fruitland Ave.
Los Angeles 58, California

Pacific Graphite Co., Inc.
2522 Malt Avenue
Los Angeles, California

Pacific Graphite Co., Inc.
40th and Linden Streets
Oakland, California

Snow & Galgiani
533 Second Street
San Francisco, California

Baker Fdry. Supply Co.
120 S. Linden Avenue
S. San Francisco, Calif.

COLORADO

Mine & Smelter Supply Co.
1422 17th Street
Denver, Colorado

ILLINOIS

Hill & Griffith Co.
4606 W. 16th Street
Chicago 50, Illinois

Foremost Foundry Supply Co.
Chicago, Illinois
Mail address
2400 S. 43rd Street
Milwaukee, Wisc.

ILLINOIS — Cont'd

The S. Obermayer Co.
2564 West 18th Street
Chicago 8, Illinois

INDIANA

The John M. Glass Co.
18 S. New Jersey
Indianapolis, Indiana

Frederic B. Stevens, Inc.
36 Shelby
Indianapolis, Indiana

Hill & Griffith Co.
4000 E. 16 Street
Indianapolis 18, Ind.

KANSAS

Canfield Fdry. Sup. & Equip. Co.
1721 Minnesota Ave.
Kansas City, Kansas

MASSACHUSETTS

Springfield Facing Co.
Willimansett, Mass.

MICHIGAN

A. T. Wagner Co.
2720 Wight
Detroit, Michigan

Frederic B. Stevens, Inc.
1800 Eighteenth
Detroit 16, Michigan

Wolverine Fdry. Supply Co.
3211 Belleview Avenue
Detroit, Michigan

MICHIGAN — Cont'd

E. J. Woodison Co.
7415 S. Aubin
Detroit, Michigan

MISSOURI

M. A. Bell Co.
217 Lombard Street
St. Louis 2, Missouri

St. Louis Coke & Fdry. Supply Co.
1525 Sublette Avenue
St. Louis 10, Missouri

NEW JERSEY

Springfield Facing Co.
S. Second & Bergen Street
Harrison, New Jersey

NEW YORK

The E. J. Woodison Co.
146 Chandler
Buffalo, New York

Frederic B. Stevens, Inc.
93 Stone Street
Buffalo 12, New York

M. L. Doelman
79 Morgan Parkway
Williamsville, N. Y.

Lovejoy Patent Spec. Co.
Hoosick Falls, New York

OHIO

Buckeye Products Co.
7020 Vine Street
Cincinnati, Ohio

Goehringer Fdry. Supply Co.
919 West Fifth
Cincinnati 3, Ohio

OHIO — Cont'd

Hill & Griffith Co.
1262 State Avenue
Cincinnati, Ohio

Federal Foundry Supply Co.
4600 East 71st Street
Cleveland 5, Ohio

Galion Fdry. Specialties Co.
131 W. Walnut Street
Galion, Ohio

Fenton Foundry Supply Co.
134 Gilbert Avenue
Dayton, Ohio

The S. Obermayer Co.
647 Evans Street
Cincinnati 4, Ohio

Hofman Fdry. Supply Co.
1193 Main Avenue
Cleveland, Ohio

Freeman Supply Co.
1152 East Broadway
Toledo, Ohio

OREGON

LeGrand Indust. Supply Co.
155 W. Arthur
Portland, Oregon

PENNSYLVANIA

J. S. McCormick Co.
25th Street & A. V. R. R.
Pittsburgh 22, Pennsylvania

The S. Obermayer Co.
33rd & A. V. R. R.
Pittsburgh 1, Pennsylvania

PENNSYLVANIA — Cont'd

William E. Hoffman and Son
3404 Circle Avenue
Reading, Pennsylvania

S. G. Walton
80 26th Street
Pittsburgh 22, Pennsylvania

J. C. McCoy
5232 Hutchinson
Philadelphia, Pennsylvania

TENNESSEE

F & L Sales & Service
1015 West Kirkland Ave.
Nashville, Tenn.

TEXAS

M. A. Bell Co.
5802 Colfax Ave.
Houston, Texas

WASHINGTON

Pearson & Smith
W. 1133 College Avenue
Spokane, Washington

Carl F. Miller & Co.
1217 6th Avenue, S.
Seattle, Washington

WISCONSIN

Fire Brick Engineers Co.
2400 South 43rd Street
Milwaukee 1, Wisconsin

Foremost Foundry Supply Co.
2400 S. 43rd Street
Milwaukee, Wisc.

THE FANNER MANUFACTURING CO.

designers and manufacturers of FINE FANNER CHAPLETS AND CHILLS

BROOKSIDE PARK **CLEVELAND 9, OHIO**

Circle 597 on Page 103

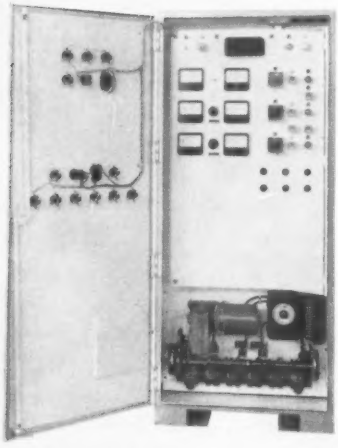
automatic

economical

accurate

fast

SAND CONTROL
IS HERE
RIGHT NOW!



Entire mixing sequence is automated from this single cabinet! *Sensing probe is in mixer . . .* consequently there is no increase in mulling time. Operates on any batch type mixer. Fast, foolproof setting for positive moisture control. Panel lights identify each phase of sequence.

Complete particulars sent on request.

HARTLEY Controls
CORPORATION
NEENAH, WISCONSIN

Circle 598 on Page 103

samra, Belcher Malleable Iron Co., Easton, Mass.; Accounting—Lyman Whaley, Cadillac Malleable Iron Co., Cadillac, Mich.; Market Development—Richard W. Crannell. The redesign and conversion contest sponsored for the first time last year by the Market Development Council proved successful and, it is hoped, will be continued, according to Mr. Crannell.

Report of the Finance Committee was presented by James H. Smith, Central Foundry Div., General Motors, Saginaw, Mich. Lowell D. Ryan, executive vice president of the society, announced for the Handbook Committee that the new edition of *Malleable Iron Castings* handbook will be available next spring.

Speaking of research and technical developments, James H. Lansing, MFS technical and research director, reported that results of the high-temperature studies were to be presented at the annual meeting of the American Society for Testing Materials the last week in June. This work, he indicated, should result in new opportunities for high-temperature applications of malleable iron castings.

Study Corrosion Resistance

The study of resistance to atmospheric corrosion is under way, with test plates installed at Kure Beach, N. C. Additional plates are to be installed at East Chicago, Newark, California and Pennsylvania. Work is being continued on malleable iron machinability research, including an investigation of tool life. Valuable results are being obtained from shop practice meetings, which are well attended.

High light of the annual banquet was the 12th annual presentation of the society's highest award, the McCrea Medal, to James H. Smith, general manager, Central Foundry Div., General Motors, Saginaw, Mich., in recognition of his distinguished service to the malleable iron industry. The presentation was made by Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich.

Mr. Smith, who began his foundry career in 1921 at the Saginaw Malleable Iron Plant, is a past president of the Malleable Founders' Society and for many years has been active in its affairs. He is also a past president of the Foundry Educational Foundation, regent of General Motors Institute, and a past director of the American Foundrymen's Society. The AFS awarded him its Peter L. Simpson Gold Medal in 1953.

In the report of the executive vice president, Lowell D. Ryan emphasized that changing conditions necessitate application of imagination and resourcefulness for successful selling. Quality of personnel and production processes and ability to develop new sources of business will have an important influence on the future of the malleable industry, he declared.

Featured speakers at the meeting were Richard H. Peake, manager-community relations, General Electric Co., Cincinnati, and William L. Shirer, author and news analyst.

Speaking on "Better Business Climate," Mr. Peake pointed out that industry is largely to blame if the conditions or climate in a community under which it is required to operate are bad. This climate is influenced by local, state, and national problems. It can be made favorable by a company's practicing good corporate citizenship in its relations with its employees and citizens of the community. It is a job, however, that must be done by the individual company, not by an organization of businesses.

Mr. Shirer said that conduct of the government in foreign affairs will have much to do with the economic future of the United States. Failure to lick the present recession also would have a major effect on foreign relations and the struggle with the Communist world. Peace has prevailed because of the relatively equal striking power of the United States and Russia, but the start of disarmament is blocked by inability to reach agreement on an inspection plan. Mr. Shirer sees in the resurgence of Germany as an industrial power the possible creation of a threat to peace some time in the future, particularly should an alliance with Russia be the price of a reunion of eastern and western Germany.

Two Philadelphia Companies Acquire Carver Foundry

Carver Foundry Inc., Fairview Village, Pa., has been acquired by Wayne American Co., and C. H. Wheeler Mfg. Co., both of Philadelphia, with ownership divided equally between the two companies. The Carver firm will be operated independently, under joint supervision of both owners. A jobbing foundry, the plant is capable of making gray iron castings up to 4000 lb and nonferrous castings up to 2000 lb. Facilities will be modernized and improved.

Heavy Equipment Foundry Reports:

FASTER SET-UP
EASIER SHAKEOUT
of cores made with RCI COROVIT BINDER

Big cores, like the one you see here, are commonplace at the Kennedy-Van Saun Manufacturing & Engineering Corp. in Danville, Penn. "With RCI COROVIT 7202 binder", says Mr. Harry Lynn, assistant foundry manager, "*cores that required up to 36 man-hours to produce are now finished in 12!*

"No more hand ramming is needed," Mr. Lynn explained, "COROVIT sand is simply shovelled into the box, spread out by hand, then struck off.

"In addition, COROVIT-based sand mixed with RCI's accelerator cures partially at room temperature. It hardens quickly to support itself, thereby *eliminating up to 75% of arboring, wiring, etc.*

"Another big advantage in using Reichhold COROVIT is easy shakeout every time.

"At Kennedy-Van Saun", Mr. Lynn concluded, "we plan to convert almost completely to this core binder, which gives us *the most efficient, fastest method of preparing cores that we have found to date.*"

If *you* would like full information on using this important new *self-curing* core binder, write to RCI for COROVIT BULLETIN F-11-R.

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N.Y.

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FOUNDRY PRODUCTS
FOUNDREZ—Synthetic Resin Binders
COROVIT—Self-curing Binders
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Creative Chemistry... Your Partner in Progress RCI

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

PRECISE international comparisons have established that the optical pyrometer temperature scales of Canada, the United Kingdom, Germany, and the United States are in satisfactory agreement according to the National Bureau of Standards. Thus, within these countries, all measurements of high temperatures now have a common basis, and the results obtained in one laboratory should be comparable with those of another.

Molybdenum Coatings

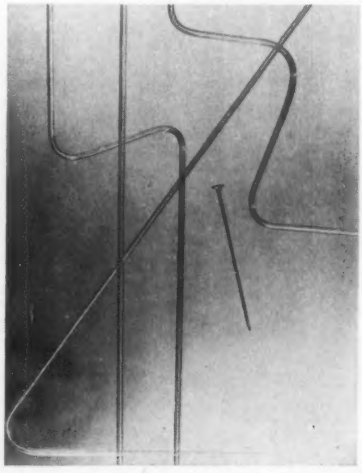
TWO promising deposition processes for coating other metals, graphite, and ceramics have opened the door to wider utilization of the favorable properties of molybdenum, according to Dr. H. W. Schultze, Climax Molybdenum Co. Div., American Metal Climax Inc. One process is the hydrogen reduction of molybdenum pentachloride. Under reduced pressure in the order of 20 mm Hg and at a temperature around 1560° F, pure molybdenum is deposited. Other method is the thermal decomposition of molybdenum hexacarbonyl. At a temperature of about 660° F, molybdenum is deposited. By an increase in the temperature, molybdenum carbide is deposited.

Bearing Steels

STEELS suitable for use in aircraft bearings at temperatures up to 900° F are described in a report of Air Force-sponsored research recently released by the Office of Technical Services, Department of Commerce, Washington 25. Designated PB 131609, "A Study of the Metallurgical Properties That Are Necessary for Satisfactory Bearing Performance and the Development of Improved Bearing Alloys for Service up to 1000 F," the report presents data obtained in the examination of 29 steels ranging in type from SAE 52100 to hot work and other tool steels. Although none was found suitable for application at 1000° F, a number were found suitable in the range 700 to 900° F. In addition to possessing optimum metallurgical properties required in high-speed bearings, the steels are comparatively lean in alloying elements. Price of the report is $2.

Forms Accurate Passages

PRECISION forming of tiny passages in alloy castings for high-temperature applications is accomplished by a method introduced by Corhart Refractories Co. Inc. Div., Corning Glass Works, Louisville, Ky. Material for the cores to form the passages is Vycor, a 96 per cent silica glass in the form of tubing which can be obtained with an OD as small as 0.020 in. As shown in the accompanying illustration, the tubing is available in straight, curved, or bent sections, and it is claimed that bore and OD dimensions can be held to tolerances of plus or minus 0.001 in. per in. For more complicated cores, which cannot be fabricated from tubing, the firm reports that other techniques are available for producing a variety of configurations. One application of the tubing is in cast turbine blades for jet engines for forming coolant passages. Expansion coefficient of the glass is extremely low, and it is said it will withstand temperatures over 3000° F. Glass core is removed after the casting cools by leaching with molten caustic without harm to the casting.



Shaped glass tubing forms tiny cores in high-temperature alloy castings

Elevated Temperature Data

HIGH level of performance may be expected from ferritic malleable irons at 800, 1000, and 1200° F with a distinct anomalous behavior on the part of low carbon ferritic material which exhibits unexpectedly high strength at 800° F. Those data resulted from an investigation on "Stress - Rupture and Creep Properties of Malleable Iron at Elevated Temperatures," details of which were presented in a paper by L. C. Marshall and G. F. Sommer, Link-Belt Co., Indianapolis, at the annual meeting of ASTM, held recently in Boston.

Follows Sun

FULLY automatic electronic solar tracking system to maintain precise alignment of the parabolic lens with the sun as well as motor-driven remote controls for sample positioning and temperature adjustment are reported to be features of a new mobile solar furnace. Temperature can be adjusted to any desired operating level up to 7000° F. Developed by Thermal Dynamic Products Inc. Division, Waltham Precision Instrument Co., New York, the furnace is said to eliminate influences such as electrical and magnetic fields, and the atmosphere surrounding the material being melted can be controlled by use of a hemispherical bell-jar test chamber.

Creep Properties

INFORMATION on "The Creep Properties of Three Low-shrinkage, Copper-Base Castings Alloys" was presented in a paper by W. F. Simmons and J. G. Kura, Battelle Memorial Institute, Columbus, Ohio, at the recent annual meeting of ASTM. Alloys were 80-10-10, 85-5-5-5, and Navy M (88-6½-1½-4), tested at 350, 450, and 550° F. At 350° F, the highest creep resistance was exhibited by Navy M. At 450° F, the Navy M and 85-5-5-5 alloys were about equal. At 550° F, the Navy M and 85-5-5-5 also were about equal, but the Navy M appeared more stable than the 85-5-5-5 alloy at that temperature.

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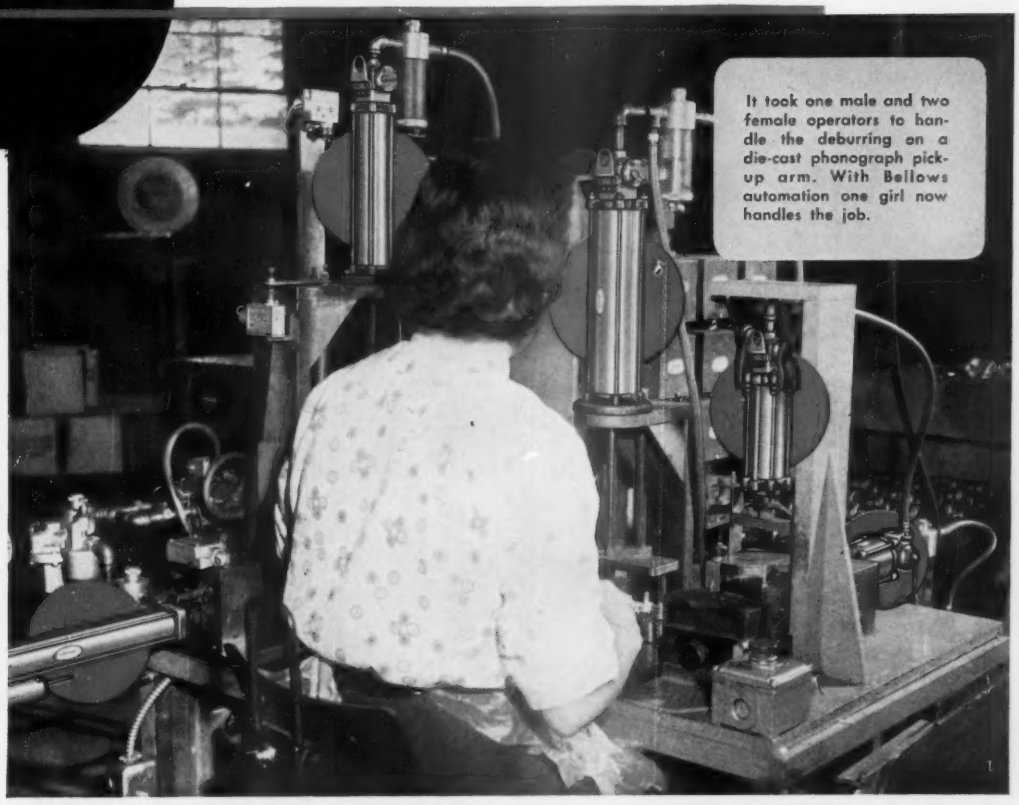

It took one male and two female operators to handle the deburring on a die-cast phonograph pick-up arm. With Bellows automation one girl now handles the job.

...a fast way to important cost savings

Any plant, no matter how large, consists of many "small plants" or separate manufacturing centers. Sometimes these separate manufacturing centers consist of no more than a single operation; sometimes they embrace a group of related operations.

A quick approach to important cost savings can be to "spot automate" these separate "small plants" with Bellows Controlled-Air-Power Devices.

These packaged work units can be quickly incorporated into existing equipment to make it fully automatic; can be used to interlock or program a number of machines or operations; or can form the key components in low-cost, tool room-built, special purpose machines.

A Bellows Field Engineer (there is one or more in every major industrial area in the United States and Canada) will be glad to discuss with you the ways you can use to "spot automate" your plant. No obligation, of course. Phone him (he's in the book under "The Bellows Co.") or write to us in Akron.

Would you like a copy of this booklet?

Write Dept. FO-858. Ask for the booklet—"Automation can fit into Your Picture."

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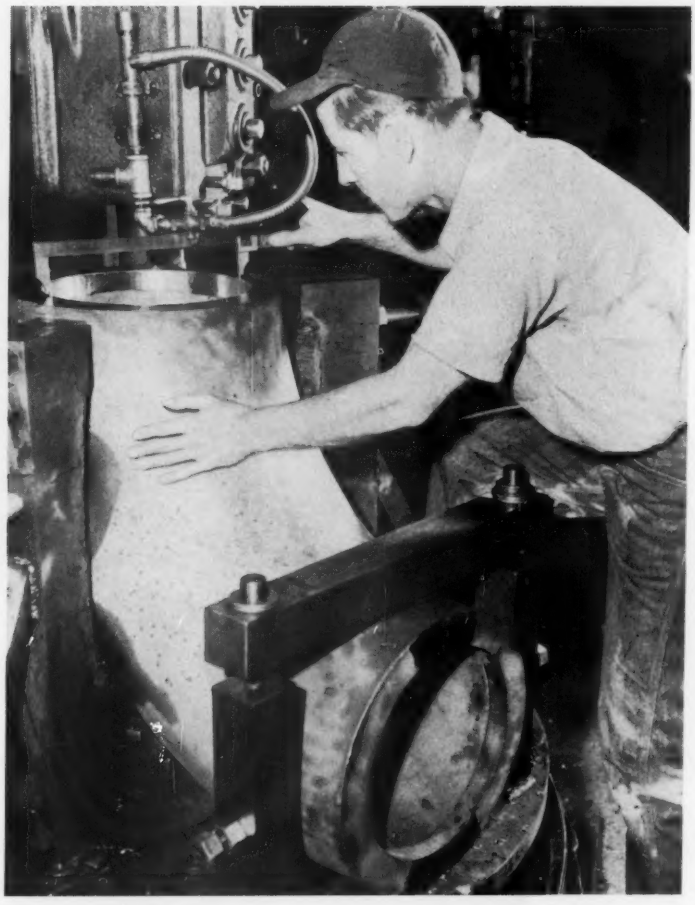
Circle 600 on Page 103

Eight primary loop main stop valves like this one are part of the Shippingport Atomic Power Station reactor container. They are cast of type CF-8 stainless alloy



Made of type CF-4 cast stainless alloy, this 16-in., 90-degree elbow is set to be used in the Special Power Excursion Reactor Test III reactor

Stainless Castings Use Growing in

NUCLEAR POWER EQUIPMENT

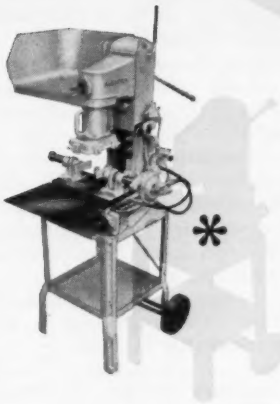
NOTWITHSTANDING difficulties caused by the many specifications for components of nuclear power equipment—specifications set by the military services, prime contractors, and various standards bodies—use of stainless castings in high-pressure, high-temperature power plants is increasing. This trend was brought out by users and producers who attended the recent Heat and Corrosion Resistant Alloy Castings Conference, held at International Nickel Co.'s Harbor Island Test Station, Wrightsville Beach, N. C.

High-alloy casting producers and users of such castings in nuclear power, petrochemical, pulp and paper, cement, enamel, and glass industries discussed their problems and progress. On the positive side, some typical examples of important cast stainless components used in nuclear power plants came out of the discussions:

1. In the Shippingport Atomic Power Station recently put in operation by Duquesne Light Co., the pressurized water reactor has four primary coolant loops, each of which includes cast main stop valves and a large, complex, double-volute pump casing. The 8000-lb pump casting, made of ACI type CF-8 alloy, has met all requirements of the ASME Power Boiler and Unfired Pressure Vessel Code. The 18-in. valve bodies, which must have a high degree of reliability, also are cast of type CF-8 alloy.

2. Huge cast stainless volute pumps, almost double the weight of similar units in the Shippingport reactor, will be used in the pressurized water reactor plants of Yankee Atomic Electric Co. at Rowe, Mass., and of Consolidated Edison at Indian Point, N. Y. Each of these type CF-8, 15,000-lb pump casings will have a capacity of 24,000 gpm. As in the Shippingport plant (Fig. 1), flow in the primary loops of these newer installations also will be controlled by cast stainless valves.

3. Detroit Edison's Enrico Fermi nuclear power plant, now under construction at Monroe, Mich., will include a pump cast of type CF-4 or CF-8C stainless alloy to handle liquid sodium at 800 to 1000° F. This facility will be the first fast-



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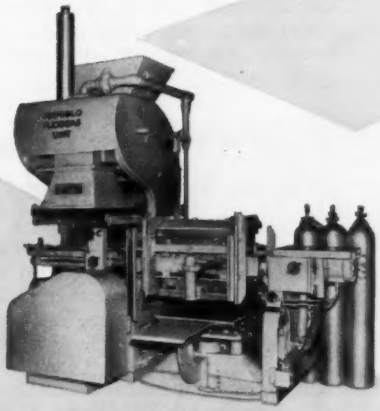

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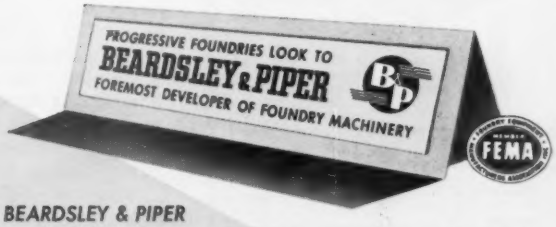
CB15	FLEXIBLO-FLEXIGAS	70 lbs.
CB18	FLEXIBLO-FLEXIGAS	125 lbs.
CB20	FLEXIBLO-FLEXIGAS	125 lbs.
CB30	FLEXIBLO-FLEXIGAS	400 lbs.

Note: Flexiblo-Flexigas units, except the CB5, are available as blow-squeeze-gas units.

HIT OF THE CLEVELAND FOUNDRY SHOW



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Circle 602 on Page 103

breeder-reactor central station power plant to utilize liquid sodium as a heat-exchange medium.

Confusion in Specifications—Although there were many reports of solid progress, without question the hottest discussions at the conference centered around the various specifications for nuclear power equipment. Some of these specifications were termed "unrealistically restrictive"—so restrictive that they are retarding the development of more efficient power plants. This is the reasoning:

The only way to gain efficiency and to lower unit cost in power generation is by increasing temperatures and pressures. Thus the stainless and higher alloys are definitely indicated. In the design of components such as the pumps, valves, and fittings needed to handle pressurized water systems used in current types of nuclear power plants, high-alloy castings are preferred for at least two important reasons: 1. The complex shapes of this type of equipment are made most economically as castings, rather than as welded assemblies of many plates, forgings, etc. 2. At the higher temperatures (above 1500° F) being considered for new designs, reliable technical data show that cast alloys have higher strength than "comparable" wrought alloys.

Casting producers said that they recognize the need for reducing the cost of equipment used in reactor service and that they want to do something about it, but high foundry expenses forced by some specification requirements prevent potential economies.

Evidence seems to be piling up that many of these specifications have little to do with service conditions. Unlike x-ray inspection requirements, which are accepted as justified to insure the high integrity needed for pressure castings, the requirements for surface finish were considered greatly excessive by almost everyone at the conference.

Several consumers indicated their belief that surfaces only half as smooth as those being asked for would be quite adequate. Furthermore, many specifications call for an "RMS" surface finish, appropriate only for machined surfaces, and it was felt that this method of designation is wrong for castings. It was agreed that the proper standard for cast surfaces is the accepted "Cast Surface Comparator."

There was a general impression that tough requirements were based not so much on genuine knowledge as they were on lack of experience. The setting of high safety factors was thought to be more of a hope than a conviction.

Future Needs—High-alloy foundrymen at the conference took note of reports from some equipment builders which indicated a need for improved materials to handle liquid metal coolants. Under certain conditions, sodium, one of the important heat transfer media, apparently leaches out carbon from stainless steel. A bright spot in this picture, however, came from a technical expert of an important pump builder who reported that his company had made and successfully tested pumps with impellers cast of type CF-8C (containing columbium), for handling liquid sodium around 950° F. He went on to report that the company now is designing an all-cast-stainless pump (both impeller and casing) of type CF-8, the most frequently used of the 18-8's, to handle uranyl sulfate.

Some users expressed the desire for alloys stronger than those now used in pressurized water reactors operating in the 600 to 1000° F range. Several answers to this problem were suggested, including the use of high carbon, partially ferritic alloys such as ACI type HE.

All agreed that there was no doubt of the bright future for cast stainless alloys in nuclear power plant construction. According to Dr. E. N. Skinner of International Nickel Co., the steady trend toward higher pressures and temperatures in power generation soon will mean "greatly increased use of stainless and high-alloy castings, because cast alloys are stronger than equivalent wrought compositions at temperatures above 1600° F."

Armour Will Dedicate Addition To Metals Research Building

Armour Research Foundation of Illinois Institute of Technology, Chicago, will dedicate a $1,200,000 addition to the metals research building on Oct. 20. The four-story addition, on the north end of the building at 3350 South Federal St., will more than double the amount of previously available space. It will provide space for research sections of electrochemistry and applied, powder, reactor, physical, and nonferrous metallurgy, as well as new offices for the department. The original metals building will be devoted to pilot-plant and other large-scale operations, including the welding, foundry and steelmaking, and metallurgical processes sections.

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561	576	591	606	621	636	651	666	681	696	711	726	741	756	771	786	801	816	831	846	861	876	891	906
562	577	592	607	622	637	652	667	682	697	712	727	742	757	772	787	802	817	832	847	862	877	892	907
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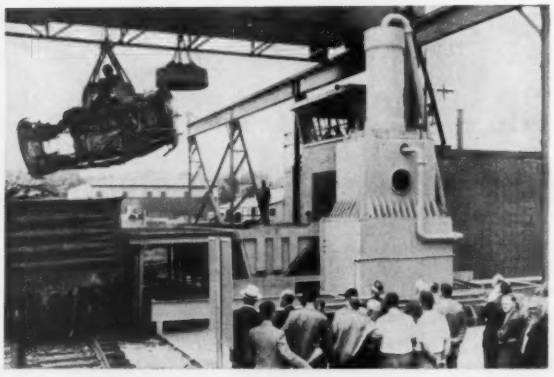
Circle 603 on Page 103

News Views

OFFICIAL OPENING: Present at the recent opening of the new Product Engineering building of Behr-Manning Co., Troy, N. Y., and its National Coated Abrasive Machinery Show were Dirck J. Olton, Product Engineering Dept.; Milton P. Higgins, Norton Co. president; Gov. W. Averell Harriman; Elmer C. Schacht, Behr-Manning president, and Troy Mayor John J. Purcell

THE WINNER: Hugh Rudder, second from right, foundry superintendent, Massillon Steel Castings Co., won this television set for his guess of the number of shot in a bottle at the National Metal Abrasive Co.'s exhibit at the AFS Foundry Show. Looking on, left to right, are Harold Binge, Massillon Steel; Stanley Zansitis, Hickman, Williams & Co., and David E. Neustadt, National Metal Abrasive Co.



BIG SQUEEZE: Alter Co., Davenport, Iowa, employs a huge baling press to squeeze an auto body into a 60 x 24 x 24-in. bundle of scrap. This was one of a number of operations viewed by visitors recently when the company and its affiliate, Alloy Metal Products Inc., held an openhouse

SCIENCE EXHIBIT: Edward Frick took first place in the field of engineering with this exhibit at the Engineering Society of Cincinnati Science Fair. It included a working cupola of his design, patterns, and sample castings he made. Edward attended Hamilton High School, Hamilton, Ohio, and plans to study mechanical engineering at the University of Cincinnati, majoring in foundry work

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Ceramic Shell Molds Feature

ICI MEETING TOPICS

By ROBERT H. HERRMANN
Associate Editor

CERAMIC shell molds, their advantages and disadvantages, captured the interest of 115 foundrymen attending the Investment Casting Institute's spring technical meeting at the Occidental Hotel, Muskegon, Mich., June 24-25.

Other discussion subjects included pressure-poured castings, cast parts for airframes and missiles, casting design, European investment casting techniques, vacuum-melted alloys and alloy specifications, dip-coat and investment techniques, and a panel presentation on cost estimating.

Dr. Richard A. Flinn, University of Michigan, Ann Arbor, Mich., was presented with an honorary membership in recognition of his work for the institute and the industry. K. W. Thompson, K. W. Thompson Tool Co., New Hyde Park, N. Y., immediate past ICI president, made the award.

Group examines Misco Precision Casting Co.'s new shell for investment casting. Left to right standing: G. W. Cannon Jr. and Ted Operhall. Seated, left to right: F. H. Bennett, Dr. R. A. Flinn, Rene Roques, C. R. Whittemore, Dr. Jack Keverian, and R. R. Miller, ICI president

Pressure-Poured Precision Castings—Dr. Flinn. The pressure pouring of steel railroad car wheels in machined graphite molds at Griffin Wheel Co. was described and shown in a movie. The 33-in.-diam wheels are cast by clamping a mold on top of a ladle of metal with an air-tight seal and forcing the metal by air pressure up a 3½-in.-diam submerged refractory tube into the mold.

Each wheel, riser, and hub takes 750 lb of steel. One mold produces 1000 wheels with a slight amount of mold dressing every 100 wheels. Tolerance on the wheels is ±0.040 in. on the full diameter.

Slides showed sprockets made by the same method for crawler type tread on tanks. Other parts can be produced in almost any ferrous alloy and in some nonferrous alloys.

Casting Design for the Ultimate in Load-Carrying Ability — John Caine, foundry consultant, Cincinnati. Tensile test bar data are misleading in evaluating strength of a cast part. Serviceability of a part depends on fatigue strength, and proper design will increase such strength. To obtain ultimate load-carrying ability, castings should be designed to distribute stress evenly. This can be done by streamlining the casting, avoiding abrupt changes in section size, using large radius fillets, and by producing as smooth a casting finish as possible.

Foundrymen must improve their relations with parts designers by learning and understanding proper casting design, developing properties of design shapes, and educating designers to those properties. The design of parts should be discussed with designers before drawings are made.

The Future of Investment Castings in Airframes and Missiles — J. K. Dietz, Chance-Vought Aircraft Inc., Dallas, Tex. The annual market potential for airframe and missile castings produced by any method is a minimum of $125 million. The estimate is based on Chance-Vought airframe parts which could be cast. To realize their share of that market, investment foundrymen must be able to make castings 36 to 48 in. long with minimum section sizes of 0.1 to 0.08 in. and properties in coupons cut from castings of 260,000 psi tensile strength, 210,000 psi yield strength, and 4 per cent minimum elongation. These goals can be achieved only if foundrymen improve gating, risering, and heat treating techniques and learn more about the effects of pouring and mold temperatures, the chemical balance of alloys, and the effect of ultrasonic vibrations on mechanical properties.

Metallurgical Research Projects Associated with Investment Castings—Dr. Jack Keverian, General Electric Co., Schenectady, N. Y. Two channels of research and development work were proposed: External work sponsored by ICI member companies and conducted by outside research firms or colleges, and intra-industry work conducted by ICI members' companies. The institute's research committee would gather and distribute research results among member companies. The intra-industry project will start immediately, with each member company expected to complete at least one study within the next year.

European Investment Casting Techniques—Roger F. Waindle, Wai Met Alloys Co., Detroit, re-

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ported on a visit made with Harold P. Gray, Gray-Syracuse Inc., Syracuse, N. Y., and Robert McClelland, consultant, Santa Monica, Calif., to the Paris meeting of European Investment Casters Association and to several European investment foundries. Top-quality parts produced in European foundries are comparable or better than similar parts produced in this country. On many parts, particularly commercial work, specifications are not as tight as in this country, so production is higher and cost lower.

Many of the foundries visited are using refractory shell molds and some of them are using blown zirconium sand cores for blade vane work in wax patterns. Vanadium is being used in some of the alloys poured. Few foundries are using plastic patterns and there is little knowledge of water soluble cores.

The Future of Vacuum Alloys—Anticipated Fields of Endeavor—F. S. Badger, Haynes Stellite Co., Kokomo, Ind. Of the vacuum techniques, induction melting in a high-frequency furnace is most adaptable to investment foundry practice. Master alloys may be produced with good control over melt constituents and a minimum of oxide formation. Remelting of master nickel alloys with low aluminum and titanium contents is satisfactory in inert atmosphere furnaces. Nickel alloys with higher aluminum and titanium contents should be remelted in a vacuum.

Vacuum melting improves stress-rupture properties and service temperature range of nickel-base alloy castings. Results with cobalt-base alloys were erratic. Because there is no back pressure from atmosphere, molds poured in a vacuum permit better feeding and attainment of thinner casting sections.

Disadvantages include higher cost, possible difficulties from moisture in the vacuum system, and refractory difficulties. A high degree of operator skill is required.

Fundamental Aspects of Ceramic Shells for Precision Castings—Karl Scheffer, General Electric Co., Schenectady, N. Y. Use of ceramic shell molds may permit production of larger castings in a broader range of types. Lightweight shell molds are easy to handle, are easy to break away from the casting, and require shorter dewaxing and firing times than investment molds.

Shell molds must have a low coefficient of thermal expansion, high heat conductivity, and high strength and elasticity. They must be able to receive metals in excess of 3200° F and have a smooth mold cavity finish resistant to chemical attack. The properties of pattern waxes, refractory, and bond materials for producing shell molds were discussed.

Alumina Shell Molds for Investment Castings—F. C. Quigley, Rodman Laboratory, Watertown Arsenal, Watertown, Mass. Ceramic shell mold properties were discussed, and experiments conducted with shells having alumina as the primary material were described. Metal at 3200° F has been poured into room-temperature molds without difficulty from thermal shock. Also, there has been no reaction between metal and mold, and castings have been produced with good dimensional reproducibility.

Special Advantages of the Shell Process—Ted Operhall, Misco Precision Casting Co., Whitehall, Mich. As the result of experiments started 18 months ago, 40 per cent of castings production at the company's Whitehall foundry is in ceramic shells, and that percentage is expected to be increased to 80 by October. The company's Muskegon, Mich., foundry is being converted for 100 per cent production in shells.

Advantages of castings produced in shell molds include easy handling due to lightweight molds, easy storage, lower production cost, reduced scrap, good surface finish, and ability to produce intricate castings. Two facts illustrate these advantages. Preheat time for shell molds is 1½ hr, against 16 to 18 hr for investment molds. Scrap on an aircraft jet engine blade was reduced 43 per cent when production was shifted to ceramic shell molds.

Gating for shell molds must differ from that used in investment molds. External down runners and gates create unusual solidification patterns, resulting in problems that must be resolved to produce metallurgically sound castings.

"Safety Shoes"

Ceramic Shell Experiments at National Aluminate Corp.—Dr. Raymond Reuter, National Aluminate Corp., Chicago. Experiments were conducted with the company's binder and refractory material now available in two powder and two grain sizes. Cannon - Muskegon Corp., a supplier of alloys, co-operated in the tests which involved pouring several different alloys into molds of varying configurations. Test results indicate that good quality castings can be produced at relatively low cost.

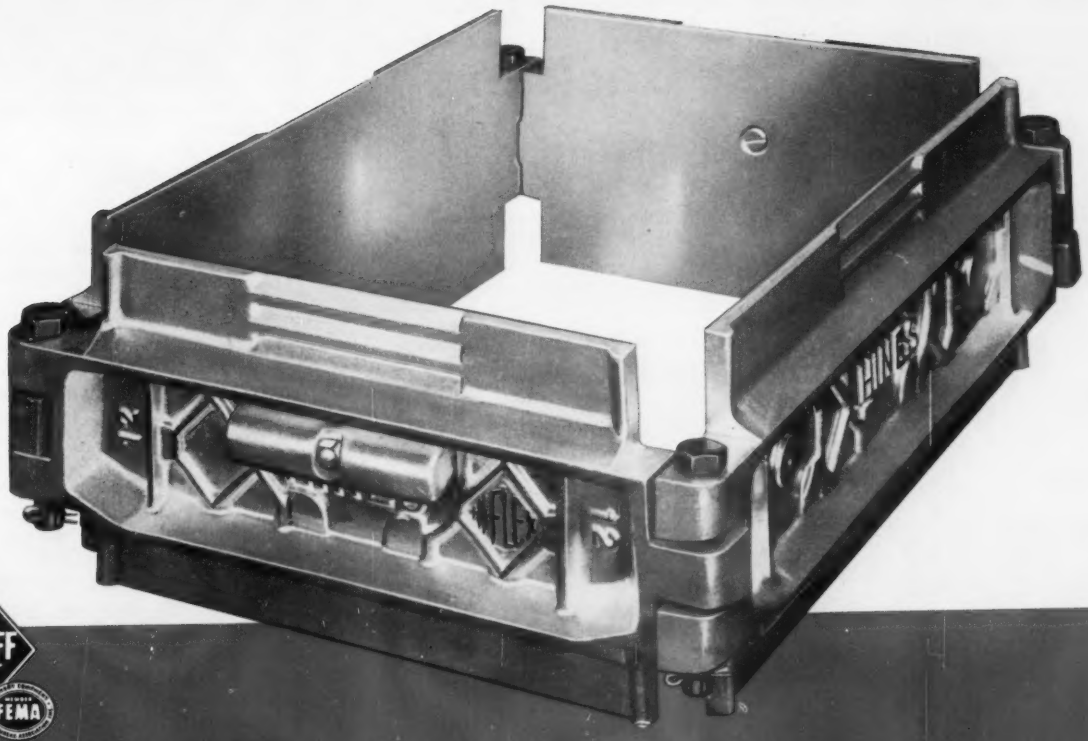
Recent Developments in the Glascast Process—J. D. Pisula, Corhart Refractories Co. A new, 100 per cent silica material has been developed for the Glascast process to supplement the original 96 per cent silica material. It is said to have greater refractoriness, less reaction with certain metals, and to be cheaper than the original material. Either of the materials may be used for molds and cores.

Investment Casting Metal Specifications—Roger F. Waindle, Wai Met Alloys Co., Detroit. Progress on test bar and specification work for various investment casting alloys was reported. Future work will deal with alloy improvement and determination of the accuracy of chemical analyses of metals.

Problems and Techniques in Dipcoat and Investments—C. R. Whittemore, Deloro Smelting & Refining Co. Various investment materials and their characteristics, particularly that of thermal expansion at different temperatures, were discussed. Properly graded refractory material is essential to production of good molds and top quality castings. Grading is especially important for material used in the dipcoat. Refractories used in the dipcoat and back-up investments must be co-ordinated properly to give the results desired.

Following Mr. Whittemore's presentation, a panel including C. W. Schwartz, Misco Precision Casting Co., Whitehall, Mich.; T. E. Moore, Ransom & Randolph Co., Toledo, Ohio; R. T. Carter, Hitchiner Mfg. Co., Milford, N. H., and I. Malkin, Precision Metalsmiths Inc., Cleveland, discussed defects, their causes and remedies, in a group of castings submitted by members.

A Cost Estimating Panel Analysis—Presented by technical and executive personnel of Misco Precision Casting Co. E. G. Chapman dis-



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cussed engineering considerations. The practicality of making the part as an investment casting must be determined. Requirements of the part should be discussed with the customer, including surface finish and tolerances acceptable for the various part sections. Design of the part then should be altered, if necessary, for ease of casting and cost reduction.

Nick Lirones presented views of the process engineer. When the casting design is set, a decision must be reached as to whether the part will be cast in a ceramic shell or an investment mold. The type of pattern, pattern setup, and gating then is determined.

Metallurgical considerations were covered by Bruce Paddock who commented on alloy selection, melting, and heat treatment procedures.

S. H. Davis reviewed inspection standards. Decisions include the number of x-ray radiographs which must be made and the angles from which exposures will be made. He pointed to the need for investment casting x-ray standards so castings suppliers and customers have a basis on which to evaluate and discuss a cast part.

C. R. Cribbs discussed cost estimating. Values should be recorded for fixed costs, materials, labor, other costs pertinent to the individual job, and estimated scrap.

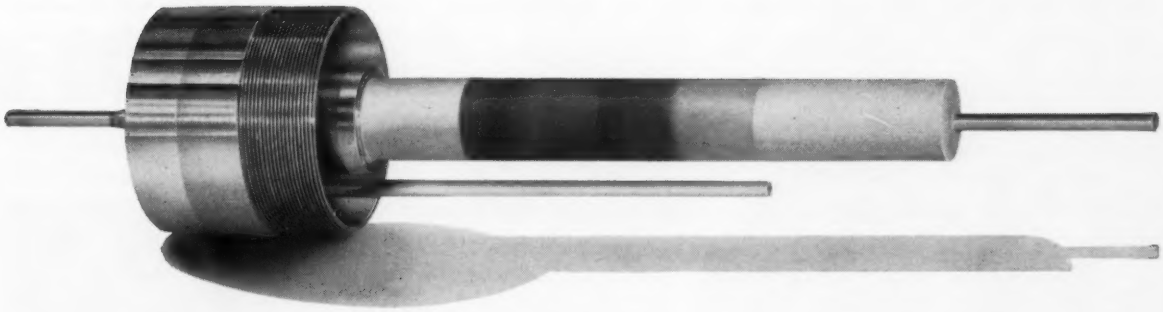
Design Clinic for Customers—R. E. Gray, Gray-Syracuse Inc., Syracuse, N. Y. The first clinic to be sponsored by ICI will be held at the time of its 1959 spring meeting in Los Angeles. Main purpose of the clinic will be to present advantages of investment-cast parts and to offer suggestions on how to design parts for the process.

Automatic Diecasting Machine Is Described in New Film

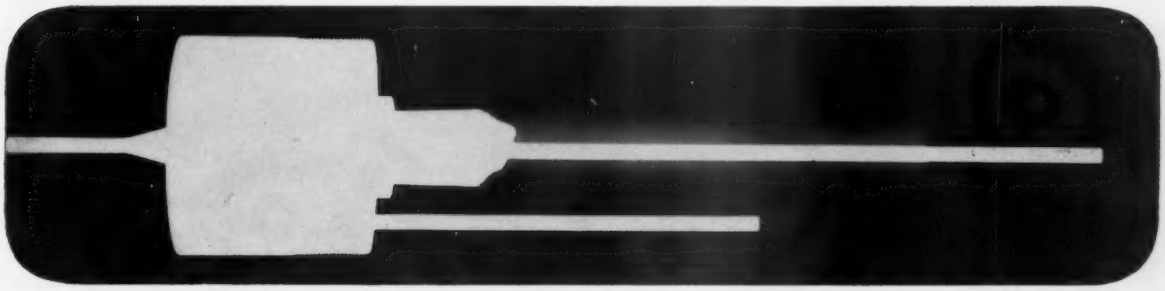
A 16-mm sound film with a running time of 18 minutes, "Automation Comes to Diecasting," has been issued by DCMT Sales Corp., Division of British Industries Corp. The film describes a completely automatic diecasting machine for small and medium machine parts and shows a bank of machines in action under normal working conditions.

The machine produces "hardware finish" zinc castings up to 1 lb at production rates often exceeding 1500 shots per hour. For information write Department K45, DCMT Sales Corp., 80 Shore Rd., Port Washington, N. Y.

Seal unit of one of the repeaters of a transoceanic telephone cable.



It has a 20-year job 3 miles under the sea



Radiography reveals no foreign particles or voids in molded areas, shows the ultimate contact of the molded insulation with the central conductor.

Radiography shows the rubber seal and molded parts are ready to take it

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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"A lot of dyed-in-the-wool gray iron foundrymen flounder around when I ask them about the basic fundamentals of iron metallurgy"

Down to Brass Tacks

SOME time ago I was invited to speak at one of Purdue's regional foundry conferences and found myself on the job one day early. Maybe my calendar was off or my specs needed cleaning or a touch of senility was gnawing away at my scant supply of gray cells.

But later I was happy with my mistake, for it turned out that a meeting was to be held that day by some officers of the Foundry Educational Foundation. Since I was already there, underfoot, I was invited to join the group, provided that I kept in mind that I was only a guest.

The principal issue seemed to be Purdue's decision to trim down its foundry manual training activities, with other specialized shop activities, and to concentrate more on the basic fundamentals which underlie all departments of applied engineering. Although voices were raised only slightly above the level required for good communication and tempers were kept fairly within acceptable bounds, there was a spirited exchange of words. The FEF boys got over some telling points for the honor of their cause, and the dean of engineering responded effectively in his defense of less frill, more drill; less self-expression, more self-discipline; and less scanning and more concentrated learning of the facts of life in engineering.

Back to Fundamentals—I couldn't stay to see how it all turned out, but I learned later that getting back to fundamentals and mastering an understanding of them through brain sweat has become a movement that is sweeping our institutions of learning in every field and all over the country. It seems that our educators are turning over a new leaf in favor of compulsory ABCs in every field of teaching and learning.

That background brings us to my point. I have before me a copy of the wonderful *Gray Iron Castings Handbook* of the Gray Iron Founders' Society—and just let someone try to get it away from me! Pete Rentschler of Hamilton Foundry & Machine Co. (God bless him!) sent it to me. Starting with the preface, I truly and really am reading every word—no spitfinger leafing through it. Up to date I've got to page 227 and have 378 more to go. It's been slow going because every once in a while I hit a snag, a clump of words I'm fairly familiar with, but which, when I got down to brass tacks, I have to admit I don't really understand. Then I have to stop and root around for a clue. I've poured quite a lot of gray iron for a peewee foundry like the Lee Hobby Foundry, and I'm proud to say it has been pretty good iron, at least for the purposes I had in mind. I've made quite an assortment of different kinds, too, by adding a touch of this and that stuff that folks have given me. I must confess, however, that when I run into words like ferrite, alpha iron, cementite, and stuff like that there, my understanding is fuzzy, to put it kindly.

I wonder what thermodynamics is?

Plenty of Company — I'm not hanging my head in shame, either. I've found quite a flock of old dyed-in-the-wool gray iron foundrymen who flounder around quite a bit when I ask them about the birds and bees of iron. I also haven't had much luck with some metallurgists. Evidently they don't know how ignorant I am on some of these ABCs, or whatever they're called in Greek. Either that or maybe they've got rusty themselves. The glossaries, those blessed gifts to practical foundrymen, seem to keep referring me to another page, which then does likewise.

Now I'm not complaining. I know my trouble: I've just had a sketchy bringing up. I haven't learned my ABCs, multiplication tables, etc., of basic metallurgy, although I have got by after a fashion.

The reason I'm baring my innermost soul is that I know for a fact that one whale of a lot of foundrymen (foundrymen in every sense of the word) are with me, in exactly the same boat, not only with regard to the fundamental composition, or let's say the basic nature

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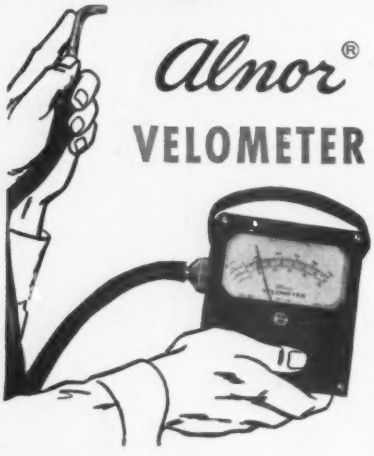

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of metals, but also regarding the ABCs of heat transfer, metal solidification and melting, the hydraulics of liquid metal, the stickerosity of clay, the cooling effect of evaporating moisture, the behavior of gases, and many other fundamentals that are involved in foundry practice.

The trouble seems to be that when some foundryman, up to his hips in making darned good castings, grits his teeth and decides, come what may, to fill in the chinks of his basic understanding of his craft, it's almost impossible for him to find time to wade through the volumes of unrelated dope and embroidery which conceal what he's looking for. In addition, the language in which the answers are expressed often is as foreign to him as a Mongolian dialect.

It Can Be Done—Now, I don't want to go overboard in proclaiming my ignorance of basic physics, because I do have more than a smattering—enough, in fact, to know definitely that a normal amount of ingenuity and a dictionary of common ordinary foundry lingo can make the material clear even to those who failed to pass the eighth grade. Not only can this be done, but in the doing, postgraduates will benefit immeasurably as a result of the effort. The reason I feel so deeply about this matter is that I have accomplished this same feat in other fields even more involved than our foundry craft.

I blush as I tell the following: Last week I took a piano lesson at the age of 67. I have been playing this cantankerous instrument since I was 12, and over these years I have averaged at least one hour of practice a day. When I played a sample for the professor at our first meeting, he kept nodding his head. When I had finished, he said, "Doc Lee, you are quite a musician. You play very well, with feeling and expression, but . . ."

If you should walk by our house now, almost any evening you will hear the scales being played, slowly, carefully, and laboriously just as an eight-year-old student would practice. Mastery of the scales is the basic foundation for the superb performances of the world's greatest virtuosos.

I haven't the least hesitancy in suggesting that we work for the translation of the basic fundamentals of our noble craft into the language our people speak. I also suggest that in our publication of handbooks and articles for foundrymen, we must keep in mind who they are—that is, the bulk of them. Above all, I hope and pray that the AFS program chairmen sandwich in, among the many splendid presentations, some highly illustrated, dramatically demonstrated, popular science talks on the simple but marvelous foundations on which our noble craft is based. We can do this without babytalk or talking down one darned bit, for we have a bunch of sharp thinking, well posted folks to deal with. I feel quite sure that such an effort would be just as effective in our schools of higher learning.

There is one great advantage to being an amateur. I have a license to stick my neck out and walk where angels fear to tread.

Book Review

ASME Handbook—Metals Engineering Processes, edited by Roger W. Bolz, sponsored by the Metals Engineering Handbook Board of the American Society of Mechanical Engineers, published by McGraw-Hill Book Co., New York. Price $13.50.

The final volume of the four-volume ASME Handbook, this work contains detailed data on the various processes by which metals are converted into finished products.

Its 45 sections and 448 pages cover such areas as casting, heat treatment, hot and cold working, powder metallurgy, welding, machining, and electroforming. For each manufacturing method, it includes a compilation of the basic physical characteristics to be considered and listings of the general advantages and limitations.

Other volumes of the handbook cover metal properties, metals engineering design, and engineering tables. Roger W. Bolz is editor of *Automation* and author of *Production Processes.*

"I thought you turned off the machinery last night"

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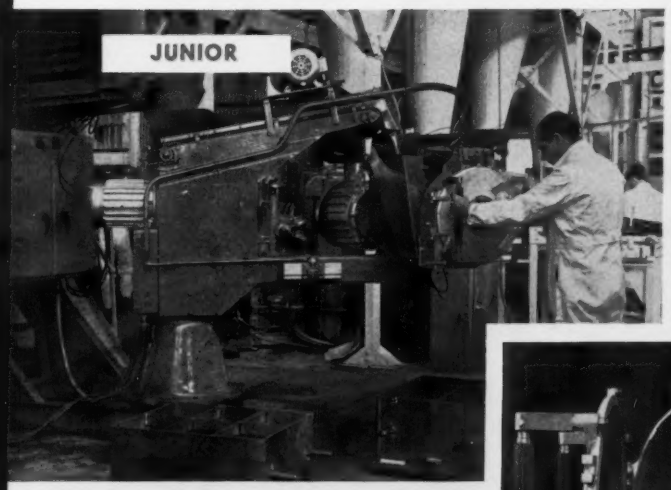
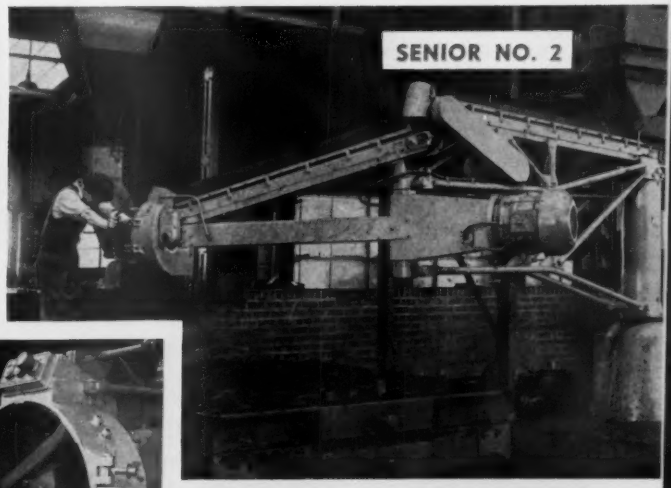
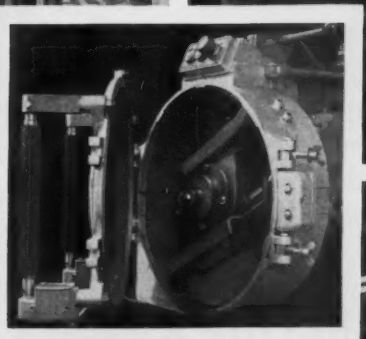
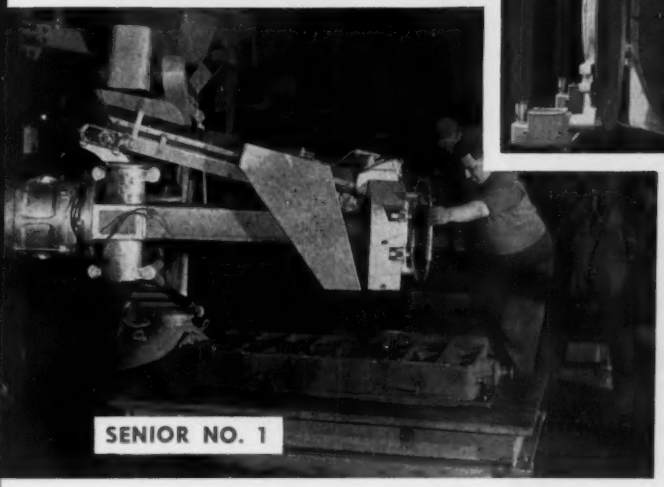
F. E. SANDRAMMERS

USED ALL OVER THE WORLD









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BRASS AND BRONZE FOUNDRY PRACTICE

Describes Brass Foundry Operation in Full

Brass and Bronze Foundry Practice, by Harry M. St. John, published by Penton Publishing Co., 1213 W. Third St., Cleveland 13, Ohio, 244 pages, 6 x 9 in., clothbound. Price, $8.

This volume for the first time brings together in one work the facts and theories of brass and bronze foundry practice. Much material has been publishd on these subjects, but for the most part it is scattered through a variety of publications. Now brass founders have available a comprehensive, modern treatment of brass foundry practice in one source.

In the past, many useful investigations have been described in terms so technical as to have little meaning except to scientists. In addition, in some instances the matters discussed are so controversial that the foundryman only can weigh the opinions of one authority against those of another of equal repute. *Brass and Bronze Foundry Practice* combines, in clear and simple language, Mr. St. John's own long experience with the experiences and opinions of others for whom he has respect.

The nearly 250 pages of *Brass and Bronze Foundry Practice* cover the entire range of brass foundry operations. Its 23 chapters discuss alloys, technical and operating procedures, quality control, testing, brass foundry economics, cost control, casting design, patternmaking, foundry layout, and salvage of waste materials. The text is accompanied by 85 illustrations which clarify and enlarge on the subject matter. A complete index expands the usefulness of the book as a reference work.

Harry M. St. John, author of *Brass and Bronze Foundry Practice*, is exceptionally qualified to make this contribution to the progress of the thousands of foundries producing brass and bronze castings. Most recently, he was associated with Crane Co., where he was superintendent in charge of brass foundry, brass forging, and die casting of aluminum and zinc. He was awarded the William H. McFadden Gold Metal of the American Foundrymen's Society in 1947 for his many outstanding contributions to the society and the foundry industry.

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Government Manual Describes Industrial Security Measures

A manual outlining protective measures which can be taken by defense plants and government facilities against espionage, sabotage, and other subversive activities has been published by the Office of Defense Mobilization, Washington. Entitled "Standards for Physical Security of Industrial and Governmental Facilities," the manual provides a general framework which can be adapted to meet the varying security requirements of a particular situation.

Security measures outlined include methods for prevention of unauthorized entry; control of authorized entry of employees and visitors; fire prevention and control; and prevention of accidents and of air, food, and water contamination. The manual can be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 30 cents.

Every inch a ladle...

"Teapot spout" pours clean without skimming!

A Chicago foundry distributes clean molten metal every time with this *Whiting Teapot Spout Ladle.* Easy to operate, there's no skimming required because floating slag forms a crust to keep heat *in* and temperature right for bottom pour. Easy to maintain, the simple spout arrangement is independent of bowl, can be relined without disturbing bowl proper!

Whiting Ladles of all types and sizes are designed to speed output, minimize labor and improve quality of foundry castings. Built to withstand the rigors of year in, year out service, they feature steel spouts, riveted or welded heads and specially designed bowl reinforcement.

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. . . it details and describes *Whiting Ladles,* shows how accurate pouring, greater safety, easier control and longer life are built into eighteen different types! *Whiting Corporation, 15607 Lathrop Avenue, Harvey, Ill.*

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Circle 612 on Page 103

Review Casting Specifications

At ASTM's Annual Meeting

By EDWIN BREMER
Metallurgical Editor

ACTIVITIES at the 61st annual meeting of the American Society for Testing Materials, held in Boston, June 22-27, included 42 technical sessions, more than 600 committee and subcommittee meetings, five luncheons, two memorial lectures, and the annual dinner.

At the president's luncheon awards of merit and honorary memberships were presented, and newly elected officers of the society were introduced. They included K. B. Woods, Purdue University, president, and A. A. Bates, Portland Cement Association, vice president. New directors are P. A. Archibald, Baldwin-Lima-Hamilton Corp.; W. L. Fink, Aluminum Co. of America; H. M. Hancock, Atlantic Refining Co.; L. A. O'Leary, W. P. Fuller & Co.; and A. C. Webber, E. I. duPont de Nemours & Co. Inc.

Following the address of Richard T. Kropf, Belding-Heminway Co., outgoing president, recognition was given to twenty 50-year members of the society including Crane Co., General Electric Co., and United States Pipe & Foundry Co. Recognition also was given to thirty-five 40-year members, including James T. MacKenzie, James S. Vanick, Iowa Malleable Iron Co., Lebanon Steel Foundry, Symington-Wayne Corp., Dow Chemical Co., Bohn Aluminum & Brass Corp., and Magnus Metal Div., National Lead Co.

The Gillett Memorial lecture, "High-Temperature Metals—Their Role in the Technolgical Future," was presented by Dr. Clyde Williams, Clyde Williams & Co. The Marburg lecture was delivered by Elmer W. Pehrson, U. S. Bureau of Mines, who discussed "Man and Raw Materials."

Prior to presentation of the Marburg lecture, the Charles B. Dudley Medal award was made to O. D. Sherby, T. A. Trozera, and J. E. Dorn, University of California. The Richard L. Templin award was made to H. F. Robertson, D. Gross and J. Loftus, National Bureau of Standards. The Sam Tour award went to W. G. Renshaw and R. A. Lula, Allegheny Ludlum Steel Corp.

Committee A-1 on Steel recommended a new tentative specification for Centrifugally Cast Ferritic Alloy Steel Pipe for High Temperature Service which includes 13 alloys with C from 0.10 to 0.20, Si from 0.10 to 2.00, Cr from 0 to 10.00, and Mo from 0.44 to 1.10 per cent. In tentative specification A352-57T on Ferritic Steel Castings for Pressure Containing Parts Suitable for Low-Temperature Service, the maximum Mn in grade LCB was increased from 0.70 to 1.00 per cent. In tentative specification A356-57T for Heavy-Walled Carbon and Low Alloy Steel Castings for Steam Turbines a revision was made in the section on magnetic particle inspection. This revision also was made in A 148-57T for High Strength Steel Castings for Structural Purposes and in A 27-57 for Mild to Medium-Strength Carbon Steel Castings for General Applications. In the latter a new grade, 70-40, was added. It contains 0.25 max C; 1.20 max Mn; 0.80 max Si; 0.06 max S, and 0.05 max P. Minimum tensile is 70,000 psi, and min yield is 40,000 psi.

Committee A-3 on Cast Iron recommended for adoption as standard specifications tentative Methods of Chill Testing of Cast Iron (A367-55T), and tentative specifications for High Strength Nodular Iron Castings (A396-55T). Revision of the standard specification for Automotive Gray Irons (A159-55) includes addition of four new alloys.

One of them is designated No. 115 for extra-heavy duty brake drums with a min TC of 3.50 and 1.10 to 1.70 Si. Others are for camshafts designated No. 123 A, B, and C. TC contents range from 3.10 to 3.75, Si from 2.10 to 2.40, Mn from 0.50 to 0.90, Cr from 0.80 to 1.25, Mo from 0.40 to 0.70, Ni from 0.20 to 0.45, and Cu from 1.40 to 1.70 per cent.

Committee A-7 on Malleable Iron Castings reapproved specifications for Malleable Iron Castings (A 47-52), Cupola Malleable Iron (A197-47), and Malleable Iron Flanges, Pipe Fittings and Value Parts for Railroad, Marine and Other Heavy Duty Service (A 338-54).

Committee B-4 on Metallic Materials for Electrical Heating Electrical Resistance and Electrical Contacts reapproved specifications for Chromium-Nickel-Iron Alloy Castings (25-12 Class) for High Temperature Service (B 190-50) and Nickel-Chromium-Iron Alloy Castings (35-15 Class) for High Temperature Service (B 207-50).

Committee B-5 on Copper and Copper Alloys, Cast and Wrought recommended revisions in standard specifications for Silicon Bronze and Silicon Brass Sand Castings (B198-52) and in Recommended Practice for Tension Test Specimens for Copper-Base Alloys and Sand Casting (B208-54). Thirteen existing standards for copper-base sand casting were reapproved by the committee.

Committee B-7 on Light Metals and Alloys, Cast and Wrought made revisions in tentative specifications for Aluminum-Base Alloy Sand Castings (B 26-57T) and for Aluminum-Base Alloy Permanent Mold Castings (B 108-57T). These include a new alloy GM70B containing 6.2 to 7.5 Mg, and replacement of alloys SC64B and SC 64C with a new alloy SC64D containing 3.5 to 4.5 Cu and 5.5 to 7.0 Si. Suggested for adoption as standards with some revisions were tentative specifications for Magnesium-Base Alloy Sand Castings (B 80-57T) and Magnesium-Base Alloy Permanent Mold Castings (B 199-57T). In standard specifications for Aluminum-Base Alloys in Ingot Form for Sand Castings, Die Castings and Permanent Mold Castings (B 179-57) Alloy SC54A-B was deleted and alloy GM70B added.

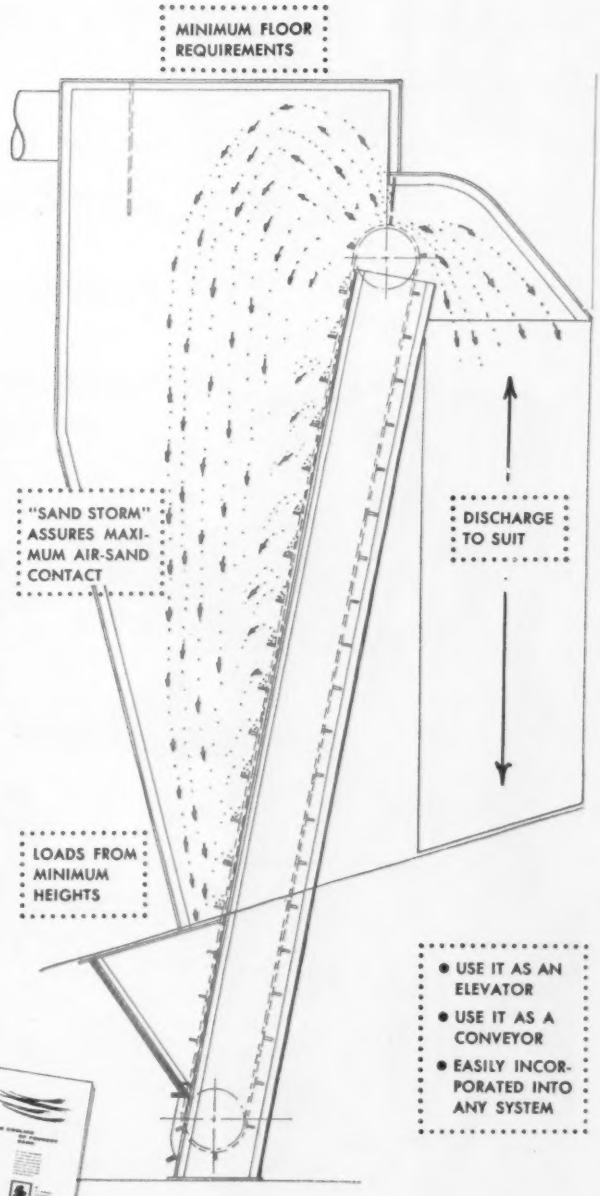
NATIONAL COOLEVAYOR

AT LAST... a practical, low cost solution to Hot Sand problems

Foundrymen have long realized the need for a competent *separate*, yet economical device to cool sand before storage. National Engineers have devoted several years to the development of such equipment because they wanted to develop a unit that would meet these qualifications and cool sand *fast*.

The National COOLEVAYOR *is* fast, efficient and extremely compact. It requires little more room than an elevator. It can, in fact, be used in *place* of an elevator or conveyor. The design permits a maximum time for air-sand contact and a maximum area for heat transfer. You'll notice in the drawing at right that a virtual *sand storm* is created within the generous sized housing.

The result? Coolevayor is designed to cool shakeout sand to within the range of room temperature—as it enters the muller or storage bin. Temperature drops of 100° and more, from 200°+, have been experienced—even on days of high humidity.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LOADS FROM MINIMUM HEIGHTS
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• USE IT AS A CONVEYOR
• EASILY INCORPORATED INTO ANY SYSTEM

SEND FOR BULLETIN

What we found out about cooling foundry sand during development of the Coolevayor makes informative reading for *anyone* with a hot sand problem. That's why we have recorded these findings in a new bulletin entitled THE COOLING OF FOUNDRY SAND. A copy will be sent to you free, upon request.

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NATIONAL ENGINEERING COMPANY

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Circle 614 on Page 103

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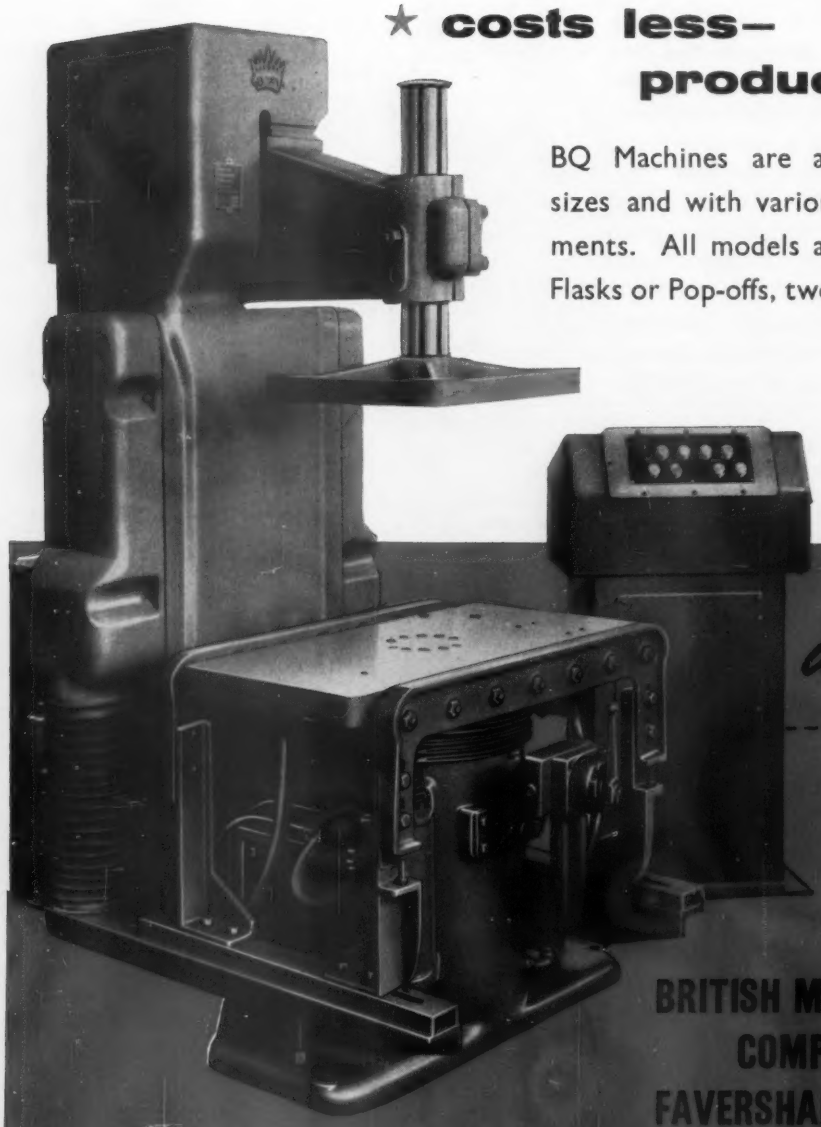

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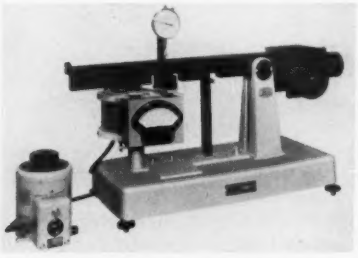
FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 153

HOT SHELL TESTER

Hot shell deflection test accessory measures mold-wall movement of shell specimens heated to 2000° F. Mold-wall movement can be measured in units of 0.0001 in. under static load ranging from 0.25 to 4 lb. Shell specimen used is a ¼-in.-thick transverse specimen.



Device consists of a small, compact furnace equipped with a thermocouple, a pyrometer, a powerstat for controlling temperature up to 2000° F, and a specimen support.—**Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 401—Page 153

COLLOIDAL GRAPHITE

High-purity, finely stabilized natural colloidal graphite called Suspension '10' is available as a concentrate at 10 per cent graphite content. User can blend and dilute it to whatever concentration he desires. Applications are for high-temerature, severe-load industrial lubrication, in a wide variety of fields.

Product dilution may vary from about 0.2 per cent graphite to about 2 per cent. The petroleum oil carrier used is a neutral-base material compatible with numerous standard and specialty oils and compounds. For general industrial use, excellent stability of suspension can be obtained by blending with neutral-base stock oils. At extreme dilutions of 0.2 per cent graphite solids, 98 per cent remain suspended for one year or more.—**Joseph Dixon Crucible Co.**, Jersey City 3, N. J.

For More Details Circle No. 402—Page 153

AIR-SETTING BINDER

Newly developed air-setting core binder, known as Lin-O-Set A-200, is intended to offer a number of advantages compared with the company's original binder of this type, Lin-O-Set II. While workability and flowability of the sand mixture are reduced, air-set bond strength and hot strength properties are higher, and there is less sensitivity to moisture and temperature variations. Rate of gas evolution and total gas also are reduced. Collapsibility is somewhat better but can be retarded by use of common hot-strength additives. It is particularly recommended for use where bond strength without baking is the goal, where it is difficult to anchor hooks adequately, and where extremely heavy overhang sections need excessive rodding.—**Archer-Daniels-Midland Co., Federal Foundry Supply Div.**, 2191 West 110th St., Cleveland 2, Ohio.

For More Details Circle No. 403—Page 153

CONVERTIBLE BANDSAW

Convertible metal-cutting bandsaw can be used as an upright unit

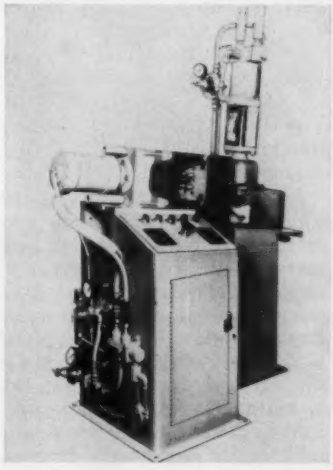
or for horizontal cutoff work. For the latter, the machine handles rounds up to 6 in., rectangular

Conversion Permits Semiautomatic Diecasting

Semiautomatic operation of DCMT-type diecasting machines by unskilled operators can be accomplished by a conversion. This conversion changes any air-operated model into a single-cycle automatic operation with all parts of the cycle controlled by preset timers. Once the job has been set up, the operator touches a button to start each cycle.

Rejects, frozen nozzles, stuck sprues, and other problems are said to be reduced greatly even though completely unskilled operators are used. Production is claimed to increase 25 to 40 per cent.—**Ideal Tool Co.**, 21 Smith St., Inwood, Long Island, N. Y.

For More Details Circle No. 427—Page 153



shapes up to 6 x 10 in., and up to 5 x 5 in. at 45 degrees. It can be converted to upright use by swinging the head to the vertical position and installing the worktable.

Selective speeds are 76, 141, and 268 fpm. Blade is ½ x 0.025 x 93½ in. and is driven by a ⅓-hp ball bearing motor. The machine features a quick-action vise and adjustable blade guides. Disc-type idler and drive wheels run on grease-sealed ball bearings.—**Wells Mfg. Corp.**, 310 Service Rd., Three Rivers, Mich.

For More Details Circle No. 404—Page 153

RADIUS CHILLS

New two-prong radius chills are said to have many advantages over old type chills. Angled prongs hold

the chill tightly in a rammed-up core. Prong holes can be used in conjunction with corebox vents. Elimination of use of nails saves labor and material.—**W. L. Jenkins Co.**, 1445 Whipple Rd. S. W., Canton, Ohio.

For More Details Circle No. 405—Page 153

LAMP

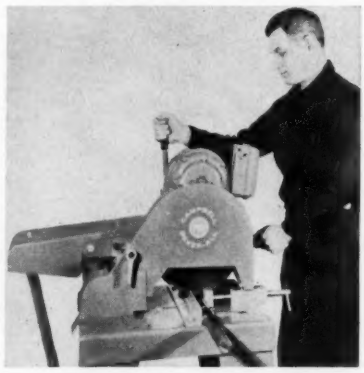
High-intensity lamp combines the features of incandescent, fluorescent and mercury vapor lighting. It screws into an ordinary electric socket, requires no auxiliary equipment, and attains full brilliance almost immediately, it is claimed. The lamp incorporates a hard glass, heat- resistant outer bulb plus a sturdy brass strap base and may be used indoors or outdoors. Manufactured in wattages of 450 and 750, the lamp is designed to burn 6000 to 12,000 hr, yielding 30 lumens per watt. — **Duro-Test Corp.**, North Bergen, N. J.

For More Details Circle No. 406—Page 153

ABRASIVE CUTTING MACHINE

Small, heavy-duty, high-speed dry abrasive cutting machine economically cuts almost any ferrous or nonferrous metal up to 2 x 2-in. solids, 3-in. standard pipe, 3 x 3-in. angle iron, and 4-in. channels. Designated the Sever-All, Model 1-A, it makes cuts at the rate of 3 to 6 seconds per square inch of metal. Oscillating action of the abrasive cutting wheel is said to enable it to cut larger cross sections with a fine-quality cut.

The unit is arranged for right-angle cutting of metals within its rated capacity. It is equipped with a vise-type work holder and an adjustable work stop. An adapter available as extra equipment pro-



vides for cutting any angle from 45 to 135 degrees.—**Allison-Campbell Div., American Chain & Cable Co.**, 929 Connecticut Ave., Bridgeport 2, N. Y.

For More Details Circle No. 407—Page 153

ELECTRIC MOTORS

Heavy-duty, capacitor-start, induction-run, single-phase integral horsepower motors are designed to provide high starting torque and operating efficiency. They are suited to the severe conditions and high starting torque required for service with pumps, fans, drill presses, lathes, circular saws, brine agitators, and similar equipment. The motors operate on 60 c, 115/230 v current and are available from ¾ hp to 1½ hp at 1200 rpm, 1 hp to 3 hp at 1800 rpm, and 1½ hp to 5 hp at 3600 rpm.—**Fairbanks, Morse & Co.**, Chicago 5, Ill.

For More Details Circle No. 408—Page 153

ALUMINUM ALLOY

High-purity aluminum casting alloy designated X357 was developed to provide high tensile and yield strengths with good ductility after heat treatment. Desirable foundry characteristics include castability, machinability, dimensional stability, and corrosion resistance.

Primarily an aluminum-silicon-magnesium type, the alloy has a high strength potential made possible by limiting impurities to as low a value as practicable on a commercial production basis. With high solution heat treatment and high aging temperatures, X357 has permanent mold properties of 52,000 psi tensile strength, 43,000 yield strength, and 5 per cent elongation. Sand-cast ingot properties are 50,000 psi tensile, 43,000 yield, and

Static Frequency Converter Supplies Power

Essentially a static frequency converter, the Multiductor is said to be an ideal power supply for many types of induction heating and melting equipment. Advantages include low initial cost, high operating efficiency, and negligible maintenance requirements. The unit contains no rotating components and is enclosed in a self-contained cubicle.

In a typical application, the equipment takes three-phase power directly from regular or primary sources and converts it to single-phase power carried from converter to furnace by conventional wiring. The three-phase load is balanced inherently at the input connections. Output can be varied continuously and under load from zero to maximum, and nothing can be damaged by over-

loads. Operation is nearly automatic.—**Ajax Electrothermic Corp.**, Trenton 5, N. J.

For More Details Circle No. 428—Page 153

2 per cent elongation. — **Kaiser Aluminum & Chemical Sales Inc.,** Dept. NR-16, 919 N. Michigan Ave., Chicago 11, Ill.

For More Details Circle No. 409—Page 153

TESTING UNIT

Unit for production testing of ferrous parts up to 24 in. long employs wet magnetic particle inspection method, either visible or fluorescent. Suspended magnetizing coil and heads permit conveyorization of parts either through or across the unit. Coil pivots and slides along the overhead track. It can be positioned between the heads for both

longitudinal and circular magnetization of parts, moved to the right for separate coil magnetization, or stored to the extreme left when not in use.

Other features include recessed front panel and 38-in. table height for sitdown operation; removable and reversible grills; infinitely variable current control; built-in line disconnect switch; and stainless steel tanks for either oil or water suspendible magnetic particle baths.—**Magnaflux Corp.,** 7300 W. Lawrence Ave., Chicago 31, Ill.

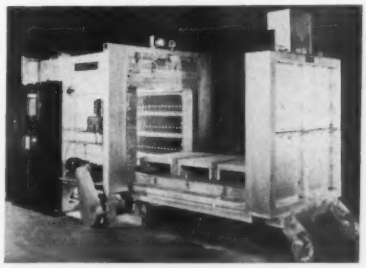
For More Details Circle No. 410—Page 153

CAR BOTTOM FURNACE

Car bottom furnace requires neither pits nor rails below floor level. It is motor driven by a rack and pinion. Additional wheels inside the furnace pick up the car as it runs in.

Heating elements are mounted on both sidewalls, the backwall, the door, and the car. They are connected to a 440-v, 3-phase, 60-c contactor and draw 100 kw. The furnace is equipped with a time switch which changes electrical connections to the elements from delta to star. This feature provides greater input when the balance of the plant is not in operation. The star connection cuts down maximum demand characteristics when the plant is in operation.

The furnace is controlled by a



Leeds & Northrup Model S strip chart recording controller. Another instrument cuts off the furnace if it overshoots the set temperature. A motor-driven fan in the roof of the unit provides circulation at lower temperatures.—**Waltz Furnace Co.,** Dept. 29, Symmes St., Cincinnati 6, Ohio.

For More Details Circle No. 411—Page 153

SKYLIGHT VENTILATOR

Combination skylight and roof ventilator incorporates a Fiberglas-reinforced plastic hood with a fan in a galvanized steel housing. The fan is powered by an electric motor equipped with automatic thermal overload cut-off switch. Counterbalanced, gravity-operated, automatic louvers beneath the plastic hood control air flow. Units are weatherproof and carry certified ratings of fire safety. Eighteen stock sizes fitted with fans measuring 24 to 48 in. in diam are offered. Plastic hoods range in size from 45 to 80½ in. square.—**Consolidated General Products Inc.,** 24th & Nicholson Sts., Houston 8, Texas.

For More Details Circle No. 412—Page 153

PLATFORM TRUCK

New 4000-lb capacity platform truck features hydraulic converter drive transmission. The unit is powered by an 18-hp, 2-cylinder, air-cooled engine and offers automotive-type steering, dual front wheels, heavy industrial drive wheels, and spinproof differential.

A two-position directional change

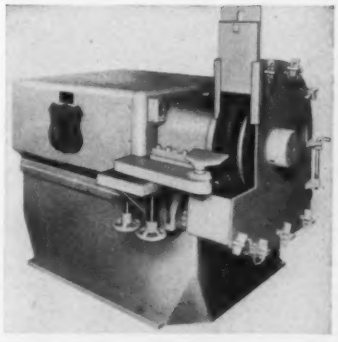
lever, accelerator, and brake control the truck. Three-element hydraulic torque converter transmission eliminates clutching and shifting, permits fast, smooth starts, and provides a continuous flow of power to meet any load condition.

The flat bed is 42 in. wide and is 78 in. long behind the engine

New Grinder Compensates for Wheel Wear

Hydraulically driven snagging grinder eliminates gears, belts, and adjustable pulley drives. The hydraulic drive is operated by a totally enclosed, fan-cooled ball bearing motor working through a hydraulic pump which moves the fluid contained in the grinder base through the hydraulic motor. This arrangement is said to provide constant horsepower, constant peripheral speed, and automatic wheel wear adjustment. These features increase production and wheel life and lower maintenance costs.

To maintain constant wheel periphery and to compensate for wheel wear, an automatic speed changer is furnished with the unit. Spindle speed is increased automatically through a safety interlock speed changer which sizes the correct rpm speed with the wheel diameter each time the



grinder is stopped.

Other features include magnetic P-B starter, shaft lock, boiler plate wheel guard, exhaust outlet and quick release guard cover, and adjustable spark breaker.—**United States Electrical Tool Co.,** Llewellyn Street, Cincinnati 23, Ohio.

For More Details Circle No. 429—Page 153

enclosure. Space at the right of the engine is 21 in. wide and 122 in. long.—**Prime-Mover Co.**, Muscatine, Iowa.

For More Details Circle No. 413—Page 153

PORTABLE CRACK DETECTOR

Low-cost, completely portable crack detector based on magnetic particle inspection quickly locates

and outlines surface cracks or other faults on ferrous castings, including hairline cracks. It weighs 20 lb and is operated easily by one man.

The unit is not affected by temperature or humidity and operates from a 110-v alternating current line or a 6 or 12-v battery. Complete unit includes probe, alternating and direct current connectors, sprinkling bulbs, gray magnetic powder, yellow magnetic powder, and operating instructions, all in a steel carrying case.—**United States Casting Repair Corp.**, 2500 E. York St., Philadelphia 25, Pa.

For More Details Circle No. 414—Page 153

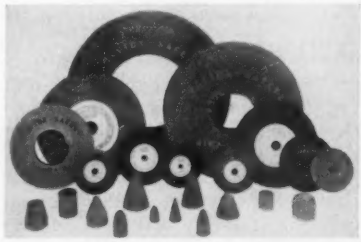
AIR HOIST

Air-operated chain hoist, weighing 30 lb, is designed to raise 1000-lb loads at a rate of 50 fpm. Powered by a reversible eight-blade air motor, the hoist is capable of lowering rates up to 96 fpm under maximum load. Control may be either manual by nylon rope and pendant or remotely with a one-hand, two-lever throttle. Lifting and lowering rate is controllable from crawl to maximum speed. Hoist is available with roller or link chains and with hook or trolley mounting. —**Thor Power Tool Co.**, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 415—Page 153

RESINOID BONDED WHEELS

Line of resinoid bonded wheels for all types of high-speed grinding applications reportedly is produced of finest quality aluminum oxide and silicon carbide abrasive grains. Pressing and forming methods assure maximum accuracy and uniform results. All wheels are machined carefully on every surface to provide close tolerances and sharp, clean-cutting surfaces. Each wheel is inspected thoroughly and



speed tested to assure safe, dependable performance. — **Simonds-Worden-White Co.**, 1101 Negley Place, Dayton, Ohio.

For More Details Circle No. 416—Page 153

AUTOMATIC ZINC LADLING

Automatic ladling unit of 350-lb capacity for attachment to small zinc die casting machines automatically ladles molten metal from preheat furnace to machine pot on demand. When the level of metal in the machine pot drops enough to break a two-probe circuit, the ladle device is energized. It automatically refills the pot with molten metal from the preheat furnace.

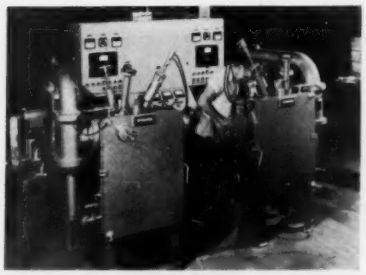
A special alloy, heat and corrosion-resistant ladle is used. It resists attack by molten metal and transfers the metal without turbulence. Because the preheat furnace is provided with an automatic temperature control, the system affords continuous operation with accurate temperature control and minimum dross formation. Unit consists of preheat furnace, ladle, electronic probes, operating cylinder and fixing bracket, flexible connections, and electronic controls and panel.—**DCMT Sales Corp.**, Dept. K48, Port Washington, N. Y.

For More Details Circle No. 417—Page 153

VACUUM MELTING FURNACES

Vacuum induction melting furnaces with capacities from 17 to 50 lb can be used for research, materials development, and production of moderate-sized parts. Compact units of low initial cost, they are delivered as complete packages. Each has its own vacuum pumping system and is completely wired and piped for immediate installation.

These Model 437-520 series furnaces are capable of handling molds up to 27 in. high and 16 in. in



diam and of pouring under vacuum in a 1 to 5-micron pressure range. They can be supplied as single or dual units. The induction power supply equipment also can be fitted with a throwover switch for alternate use with an air-melting station.—**F. J. Stokes Corp.**, 5500 Tabor Rd., Philadelphia 20, Pa.

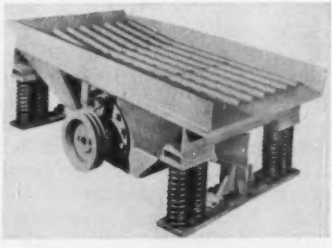
For More Details Circle No. 418—Page 153

ROOF EXHAUSTERS

Exposed surfaces of a line of power roof exhausters with capacities of 75 to 2200 cfm are made of heavy gage aluminum. Aluminum, nonoverloading centrifugal wheels are coupled in direct drive to ball bearing motors mounted out of the exhausted air stream. Motors are isolated from the hous-

Shakeout Speeds Up the Movement of Molds

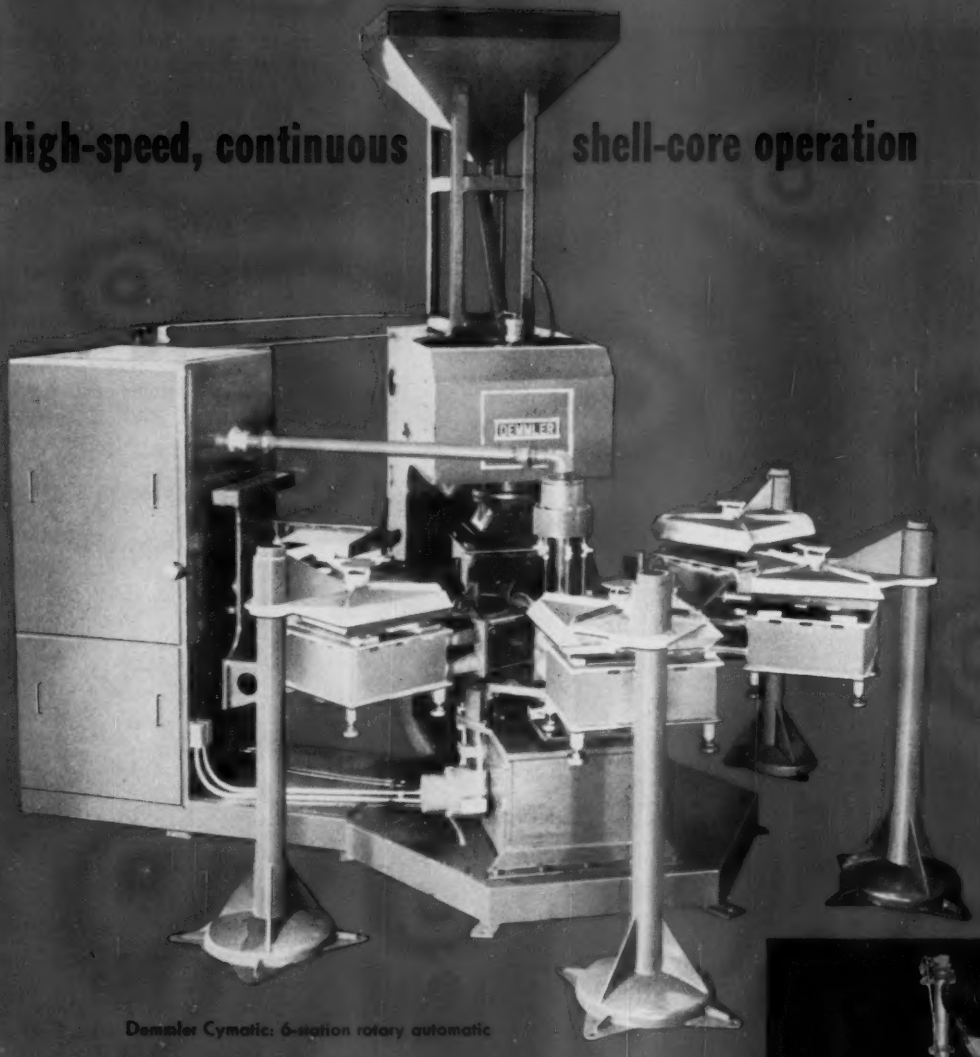
Company has developed a 4 x 6-ft shakeout for fast movement of molds from the pouring line. Feature of the unit is 6-degree slope starter deck and 3-degree slope main deck. The starter deck speeds flasks and molds onto the main deck, where they are shaken out. The shakeout has a ¼-in. throw and a No. 2 vibrating mechanism. Steel deck bars are 1 x 1 in., and the sides are 6 in. high. Flasks can be accommodated in sizes up to 24 x 30 in.—



Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

For More Details Circle No. 430—Page 153

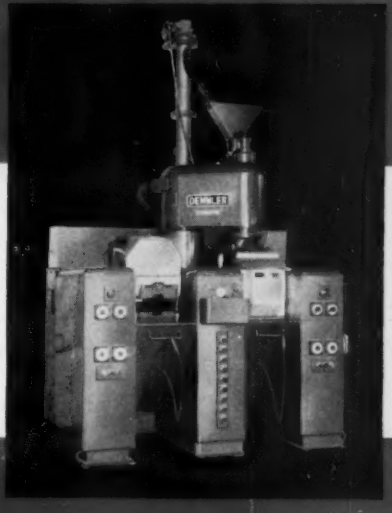
For high-speed, continuous shell-core operation



Demmler Cymatic: 6-station rotary automatic

DEMMLER "CYMATIC"

Precision shell-core equipment with new flexibility, new reliability, minimum investment



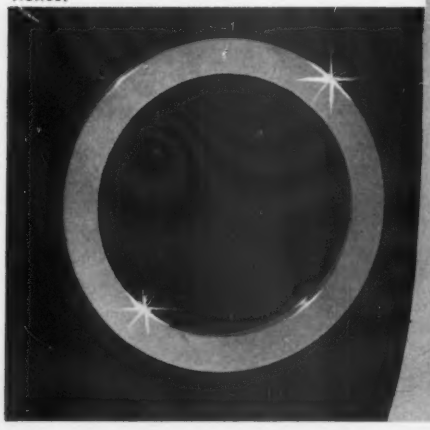
Demmler Cymatic: two-station automatic. Available in single-station models.

- Standardized short-run core boxes
- Standardized long-run core boxes
- Universal, quick-change blow plate
- Quick-change, pre-heated core boxes
- Precision heat-exchange on either half-box
- Vertical down-blow with horizontal and vertical ejection and mandrel draw

DEMMLER MANUFACTURING COMPANY
Kewanee, Illinois

Circle 616 on Page 103

Why produce red brass castings like the two above, when you can have sound castings like that below easily and economically with Foseco fluxes.



HIGHLY EFFICIENT Foseco® FLUXES

for effective treatment of copper base alloys

Insure sound gas and oxide-free brass and bronze castings in your foundry with . . .

Foseco CUPRIT
For yellow brasses and high conductivity copper

Foseco CUPREX
For red brasses and tin bronzes

Foseco ALBRAL
For aluminum, manganese and silicon bronzes

Foseco Fluxes will:

- Clean, cover and protect the melt
- Prevent zinc fuming
- Produce metal-free drosses
- Remove harmful gases
- Remove oxides and non-metallic inclusions
- Prevent build-up on crucible and furnace walls
- Insure greater pressure-tightness
- Improve mechanical properties

. . . and Foseco Fluxes are simple and economical to use

There are grades of Foseco Fluxes available for all copper base alloys and for use in all types of furnaces.

All Foseco products are scientifically designed, and are produced under the strictest quality control supervision.

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Company_____
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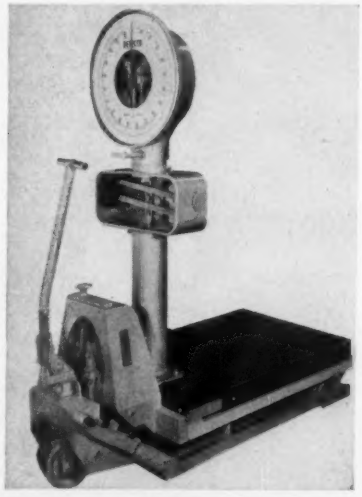
ing for quiet operation. Weathertight construction is said to be assured with one-piece inlet cone and curb. A complete line of accessories is available.—**Greenheck Fan & Ventilator Corp.**, Schofield, Wis.

For More Details Circle No. 419—Page 153

LIFT TRUCK SCALE

A complete scale system built into a lift truck permits loads to be moved and weighed simultaneously. Use of the unit is said to save time and avoid errors in weighing loads sometimes encountered in separate truck and scale systems.



The lift truck scale is a special order unit and can be built for a gross weighing capacity as high as 12,000 lb.—**Detecto Scales Inc.**, 540 Park Ave., Brooklyn 5, N. Y.

For More Details Circle No. 420—Page 153

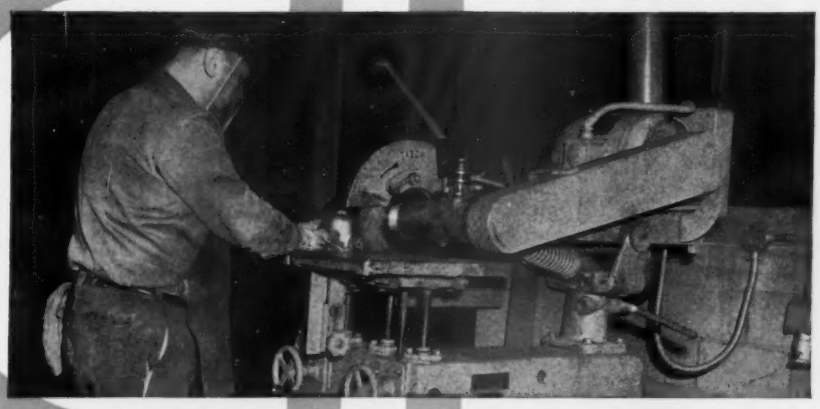
TRIM PRESS

Die casting trim press is an air-hydraulic, 25-ton unit with a stroke adjustable from zero to 12 in. Distance inside the tie bars is 17 x 33 in.; tie bar diameter is 2½ in.; area of lower platen, 31 x 40 in.; approach speed is from zero to 1300 ipm; return speed is 550 ipm; shut height, 6¼ in. minimum to 18¼ in. maximum, and pull-out tonnage of 4½. This is said to be the first of a line of presses in four-bar and two-bar models for trimming die castings, swaging, stamping, blanking, forming, drawing, shearing, and similar operations.—**B & T Machinery Co.**, Holland, Mich.

For More Details Circle No. 421—Page 153

FURNACE BLOCK

Preformed, hollow building unit made of castable refractory permits filling with additional castable to



Fall River Foundry, Fall River, Wisconsin, uses Tabor-Brasive Cut-Off, Model B-7½-AC, for clean, fast cuts on nickel, bronze, and brass gates.

Saves up to $400 per month with TABOR CUT-OFF

A new Tabor-Brasive Cut-Off Machine at Fall River Foundry, Fall River, Wis., paid for itself in five months, according to Harold E. Younger, Plant Manager. The Fall River Foundry, a subsidiary of Badger Meter Company, Milwaukee, cuts nickel, bronze, and 85-5-5-5 brass. The Tabor Cut-Off has saved up to $400 per month in band saw blades.

"In cutting 20% nickel gates, we formerly used $50-worth of saw blades per day," Mr. Younger says. "Now we are saving this cost and getting fast, clean cuts with the Tabor Cut-Off."

Tabor Brasive Cut-Offs are tough, precise, production machines. Reduce cutting time more than 50% when compared with sawing or chipping operations. Units range from 5 hp to 20 hp. Bulletin 575 gives full details — write for your copy today.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

TABOR

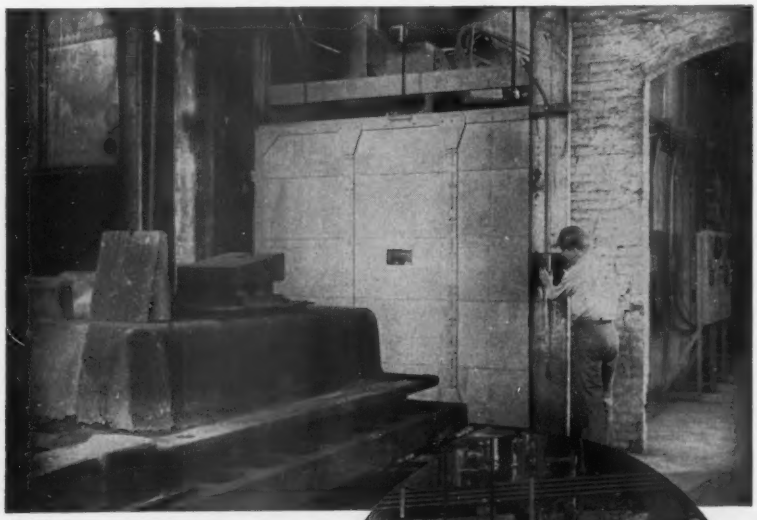
THE TABOR MANUFACTURING CO.

Division of Turbo Machine Co.

LANSDALE, PA. TELEPHONE: ULYSSES 5-5131

Circle 618 on Page 103

here's another
carl mayer installation...
Cutting Costs for its Owner



CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.

RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

Heat loss is reduced up to 1/3, and fuel savings up to 50% over old conventional methods are possible. Temperature uniformity is guaranteed.

Consult Carl Mayer now for any type foundry oven or furnace, large or small, and for any purpose. Write for Bulletin 53-CM.

THE carl mayer CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

produce a monolithic refractory construction. Available in two sizes, 9 x 9 x 13½ in. and 9 x 13½ x 13½ in., the block is said to form a jointless refractory wall with good insulating value, low heat storage, and high resistance to spalling. It is offered in four compositions to meet a hot face temperature range of 1900 to 2750° F and a cool face range of 200 to 348° F.—**Refractory & Insulation Corp.**, 120 Wall St., New York 5, N. Y.

For More Details Circle No. 422—Page 153

RENEWABLE AIR FILTER

Automatic, renewable-media air filter unit comes in 3, 4, and 5-ft widths and in heights from 5 to 15 ft in 4-in. increments. Unit features galvanized construction with well-supported frame, improved drive said to handle as many as six units, and maximum use of effective filtering area. The unit holds a 65-ft-long roll of glass fiber filtering media on the top spool. Used media, with its accumulated dust load, is rewound on bottom spool for easy disposal.—**American Air Filter Co.**, Dept. PD, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 423—Page 153

FRONT-END LOADER

Inexpensive, wheel-type front-end 420 loader features power boosting torque converter drive. Other standard equipment includes self-leveling bucket, shuttle transmission, and fulltime power steering. The torque converter permits the operator to nudge the bucket into a stockpile smoothly and to apply extra power steadily without spinning wheels or stalling the engine.

It also cushions shock loads and prevents damage to engine or power train; automatically adjusts travel speeds to varying loads; and com-

NEW CarVer RAPID MULLER

Patented, self-cleaning mixing arm, with replaceable, wear-resistant NiHard end pieces.

FAST! A BATCH EVERY 76 SECONDS!

Not only does this revolutionary new machine mix core sand *fast* . . . the mulling action is so thorough that you *save up to 30% in binder!* Each grain of sand receives an equal coating of binder, so that the finished mix is absolutely free from lumps or wet spots!

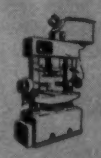
No more cleaning or maintenance problems! The new Carver Rapid Muller mixing arm does most of the cleaning itself. And it's easy to reach inside and clean, without awkward wheels and paddles to get in the way. Maintenance? There is only *one* moving part . . . *eliminating wear and costly repairs.* You can *rely* on the Carver Rapid Muller because of its *extreme simplicity* in design. Takes up only 7 square feet of floor space — *the most compact muller on the market!*

Most important, your initial investment in the Carver Rapid Muller is *two or three times lower* than most other makes!

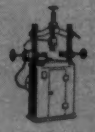
COMPARE CARVER WITH ANY OTHER MULLER -- RIGHT IN YOUR OWN FOUNDRY! Carver will place its Rapid Muller alongside *any* other muller and let its performance speak for itself. *You be the judge* — and let the best muller win!

WRITE OR CALL TODAY FOR COMPLETE DETAILS

Only CarVer Has Everything For the CO_2 Process!



CARVER V & S Core Shooters



CARVER Automatic Gassing Apparatus

KRAUSS Core Vents

STEINEX available only from CARVER

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CARVER FOUNDRY PRODUCTS CO.,
Muscatine, Iowa

RUSH information on new Carver RAPID MULLER and FREE DEMONSTRATION!

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THE "KWIK FILL" FOR BIG FLASKS

NEWAYGO'S DOUBLE ARM PIVOTED FLASK FILLER

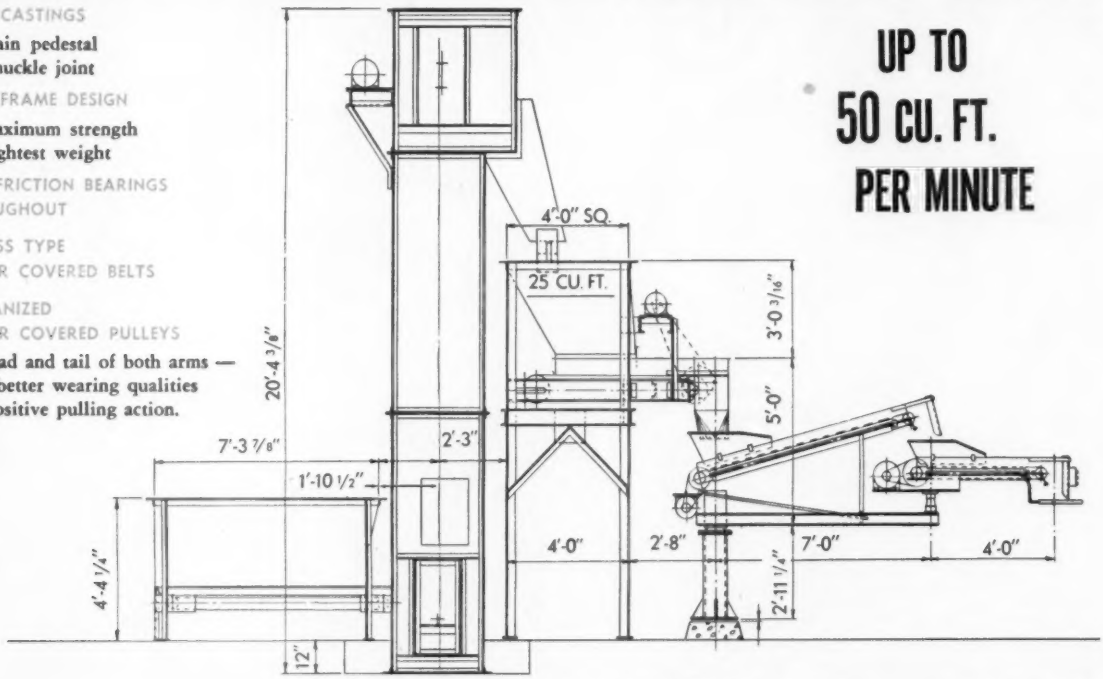
STEEL CASTINGS
for main pedestal and knuckle joint

STEEL FRAME DESIGN
for maximum strength and lightest weight

ANTI FRICTION BEARINGS THROUGHOUT

ENDLESS TYPE RUBBER COVERED BELTS

VULCANIZED RUBBER COVERED PULLEYS
for head and tail of both arms — gives better wearing qualities and positive pulling action.



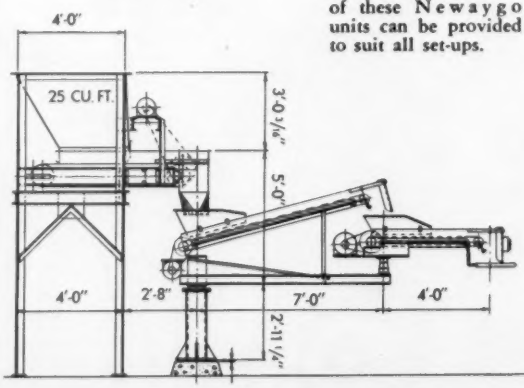
UP TO 50 CU. FT. PER MINUTE

The typical foundry set-up above incorporates the new model EHS Handy Sandy or the Super Handy Sandy in conjunction with prepared sand storage and Pivoted Flask Filler. Capacity of sand to storage is up to 35 tons per hour. The Pivoted Flask Filler has a capacity up to 50 cu. ft. per minute as needed. The filler arms are extremely well balanced for easy operation. They offer a working flexibility that permits several large flasks to be filled in an area at one time without moving the flasks. Cope and drag filling can also be handled on a pair of large molding machines or jolt tables spaced within a reasonable distance of each other.

Unit shown above has a 7 ft. primary arm and a 4 ft. secondary arm which allows flasks ranging from 3x17 ft. to 6x10 ft. or smaller to be easily filled. A 5 ft. long secondary arm will be available in the near future allowing an even greater filling area.

The illustration below is the same basic unit as above, except the prepared sand storage hopper is filled by an overhead crane or other existing sand conveying or elevating equipment.

Special arrangements of these Newaygo units can be provided to suit all set-ups.



"Foundry Business is **BIG** *Business"*

NEWAYGO engineering company
NEWAYGO, MICHIGAN

. . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

pletely eliminates clutching and engine stalling. A simple lockout lever on the dash permits operators to switch the unit from torque converter to direct drive for faster travel, for safer downhill operation, and for using the backhoe.

The unit is said to develop 4600-lb breakout force. Bucket is 63¾ in. wide with 25-degree rollback and 90-degree forward roll at ground level. The self-leveling device eliminates spillage by preventing the bucket from spilling backward when it is raised.—**J. I. Case Co.**, Racine, Wis.

For More Details Circle No. 424—Page 153

MULLING UNIT

The Mull-All is a low-cost, high-capacity mulling unit for small foundry and coreroom use. It is claimed to handle every mulling job, including natural and synthetic molding sand, facing sand, core sand, and resin-coated shell molding sand. Thorough mulling is accomplished in a short time cycle in suspension between rubber-tired mulling wheels and the rubber-lined bowl.

The mulled sand is said to be characterized by a high degree of aeration and uniformity and by maximum development of all physical properties. The unit measures 56 in. high and 36 in. wide at the base. Automatic control is available for precise control of the mulling cycle.—**Beardsley & Piper Div., Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 425—Page 153

CORE BINDER

Summer grade Kold-Set core binder is compounded specifically for use in applications involving high sand and atmospheric temperatures. Activator 150 is an improved composition used in smaller amounts per batch of sand. It is a two-stage oxygen releasing agent said to give faster, more nearly uniform setup and faster bakeout. Oxygen is released in the corebox and in the oven. The material is recommended for use with both regular and summer grade Kold-Set binder.

According to the manufacturer, these two materials make possible up to 75 per cent reduction in coremaking time and up to 50 per cent reduction in baking time. Reduced metal penetration and cleaner castings with higher dimensional accuracy also are said to result.—**G. E. Smith Inc.**, 246 Washington Rd., Pittsburgh 16, Pa.

For More Details Circle No. 426—Page 153

International Foundry Congress Will Meet in Brussels

The 25th International Foundry Congress will be held in Brussels and Liege, Belgium, from Sept. 29 to Oct. 3, during the International Exposition. The Foundry Technical Association of Belgium has been charged by the International Committee of Foundrymen's Technical Associations with the organization of the congress.

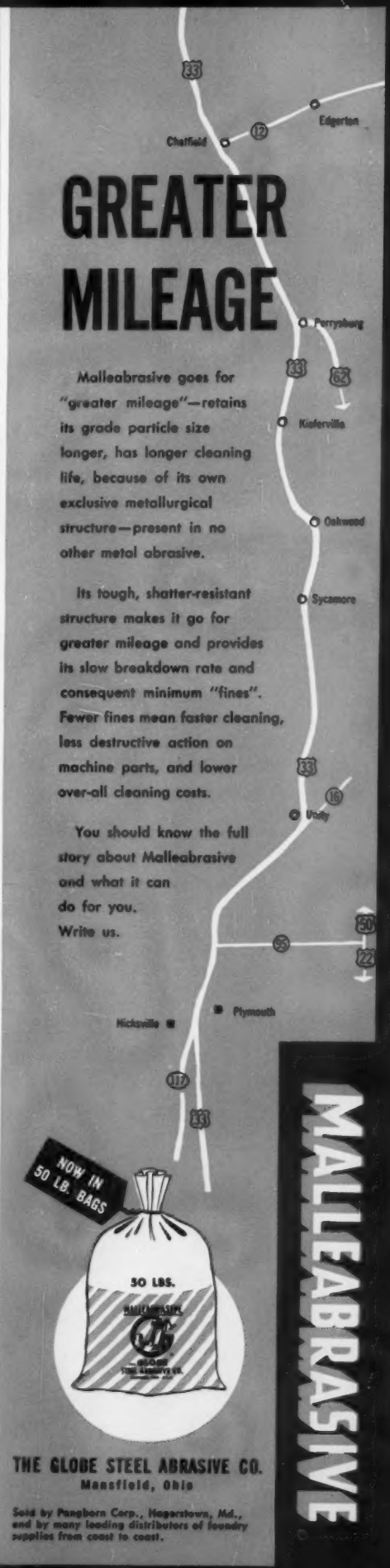
The official opening of the congress will be held in Brussels, and technical sessions will be in Liege. The program includes visits to Belgian plants and laboratories and to the International Exhibition in Brussels. The human aspect of foundry problems will be one of the major topics of the congress.

View of Town Hall, Brussels

Belgian foundrymen report that preparations have been made to welcome their foreign colleagues and friends to make their stay in Belgium as pleasant as possible.

Official AFS delegates to the congress will be Dr. A. B. Everest, Mond Nickel Co., London, who recently was appointed European representative of AFS, and Richard R. Deas Jr., Hamilton Foundry & Machine Co., Hamilton, Ohio, a national AFS director. Other U. S. representatives will include H. F. Taylor and M. C. Flemings Jr., Massachusetts Institute of Technology, Cambridge, Mass. They will present an exchange paper entitled "Adapting Theory to Practice in Making High-Strength Light Metal Castings."

Circle 622 on Page 103→


GREATER MILEAGE
Malleabrasive goes for "greater mileage"—retains its grade particle size longer, has longer cleaning life, because of its own exclusive metallurgical structure—present in no other metal abrasive.
Its tough, shatter-resistant structure makes it go for greater mileage and provides its slow breakdown rate and consequent minimum "fines". Fewer fines mean faster cleaning, less destructive action on machine parts, and lower over-all cleaning costs.
You should know the full story about Malleabrasive and what it can do for you. Write us.
NOW IN 50 LB. BAGS
50 LBS.
MALLEABRASIVE
THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio
Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.
MALLEABRASIVE

To cut costs with conveyors

Ask Standard

Starting at the molding machines, a complete Standard conveyor system, with transfer cars, is used to move flasks and molds to pouring and storage area, with return lines for empty flasks.

Step up core making production with low-cost roller conveyors

Foundries are finding new savings in production with Standard's low-cost gravity conveyors. One user of national repute states these conveyors have "worked out just fine" for making and handling cores, before and through the oven.

Heavy-duty Standard foundry roller conveyors equipped with shielded bearings make possible smooth, efficient handling of molds and flasks.

Standard offers specialized experience of more than 50 years of designing and building foundry and mill conveyors. For any conveyor need, contact STANDARD CONVEYOR COMPANY, General Offices: North St. Paul 9, Minnesota.

Left: simple, low-cost Standard gravity conveyors speed core making and handling, before and through oven. *Right*: roller conveyors carry molds to the pouring floor.

Send for Standard's special catalog — a valuable reference book illustrating and describing various conveyor installations in leading foundries. Ask for Bulletin 68 — address Dept. N-8,

Standard GRAVITY & POWER CONVEYORS

OVER 50 years of conveyor experience

Sales and Service in Principal Cities

FEF Makes First Awards of Wheelabrator Fellowships

The first eight recipients of fifty $1500 Wheelabrator fellowships to be awarded in the next ten years have been named by the Foundry Educational Foundation selection committee.

Nicholas Baloff, El Cerrito, Calif., a 1958 graduate of the University of California, will continue his studies at the same school in the field of industrial engineering. As an undergraduate, he was the recipient of FEF scholarships for two years.

Richard V. Barone, Belmont, Mass., a 1958 graduate of Massachusetts Institute of Technology, will continue his graduate work at the same school in the field of metallurgical engineering.

Harry D. Bradshaw, Hampton, Va., a 1957 graduate of the University of Alabama and a teaching assistant in the university foundry for the past year, will continue there in the field of metallurgical engineering. He was an apprentice and journeyman molder at the Newport News Shipbuilding & Dry Dock Co. He received undergraduate scholarships from the FEF, the American Society for Metals, and the Aluminum Co. of America.

Charles F. Knight, Winnetka, Ill., a 1958 graduate of Cornell University, will return there to do graduate work in business administration. His undergraduate work was in mechanical engineering. He has had extensive summer work experience in foundries in Germany, Switzerland, Argentina, and the United States.

Paul J. Lady, Kenton, Ohio, a 1958 graduate of the University of Cincinnati with a degree in mechanical engineering, has chosen Harvard Business School for graduate work in marketing.

William F. Shaw, Kohler, Wis., and James R. Widmoyer, LaCrosse, Wis., are both 1958 graduates of the University of Wisconsin where they will return for advanced work in metallurgical engineering. Both have assisted in the university foundry, and both were holders of FEF scholarships.

Robert J. Warrick, Homer, Mich., a 1958 graduate of Michigan State University, who was awarded five scholarships as an undergraduate, will continue his advanced work at MSU in metallurgy.

The Wheelabrator fellowship program is open to men who are not more than 28 years of age on the

At Campbell, Wyant and Cannon—

Quality Control of camshafts starts with HANNA PIG IRON

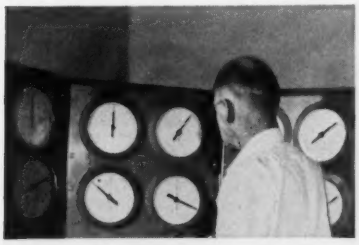
Campbell, Wyant and Cannon Foundry Company, division of Textron, Inc., has long been one of the world's leading suppliers of automotive castings. And throughout their many years of pioneering in metallurgy and foundry practice, Campbell, Wyant and Cannon has been a regular user of Hanna pig iron—both standard and silvery.

Typical of C.W.C.'s precision production in volume at their Muskegon, Michigan, foundry are cast camshafts, which were first introduced by C.W.C. to the automotive industry 25 years ago and are now used throughout the world.

Customers' specifications for these camshafts are extremely precise. Dimension, composition, including chemistry and metallurgical structure, hardness—all are vitally important.

In one of the many testing procedures employed to assure that casting quality is up to specifications, C.W.C. through the use of a direct reading spectrometer determines approximately every 20 minutes the analysis of samples taken from electric furnaces and ladles. The commercial application of spectrographic analysis of metals in the foundry was first worked out by C.W.C. in conjunction with the University of Michigan. Only metal made with pig iron of accurate analysis and superior uniformity, like Hanna pig iron, can pass this exacting quality control check.

Hanna produces all regular grades of pig iron as well as HannaTite and Hanna Silvery. All grades are available in the 38-lb. pig and the smaller HannaTen 12½-lb. ingot. Your Hanna representative will be pleased to tell you more about the advantages of using Hanna pig iron.



At 20-minute intervals, C.W.C. checks metal analyses with a direct reading spectrometer.

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

50 YEARS OF PROGRESS IN BETTER FOUNDRY METHODS ... IN WIDER USE OF CASTINGS

CWC

Founded 1908

A few of the 50 million camshafts produced by Campbell, Wyant and Cannon Foundry Company.

Circle 624 on Page 103

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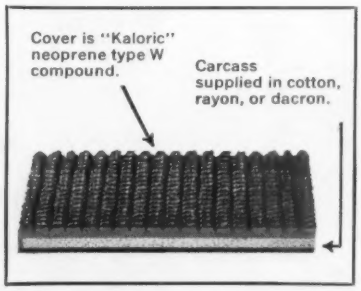

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day of application and who are either a senior undergraduate or graduate student registered with the FEF, or a returning veteran who was either registered with the FEF or employed in the foundry or allied industry. Also eligible are otherwise qualified men currently employed in the foundry field.

Applications are now being accepted from persons desiring to begin study in September, 1959. Deadline for applications is Dec. 31, 1958. Application forms can be obtained from the Foundry Educational Foundation, Terminal Tower Building, Cleveland 13, Ohio.

Surplus Machine Tools To Go To Educational Institutions

To step up the government program in training youth of the nation with industrial skills, a large store of machine tools is to be channeled to state and local educational institutions, according to H. B. McCoy, administrator, Business and Defense Services Administration, U. S. Department of Commerce. Actual distribution will be handled by state agencies for surplus property in each state, which work with U. S. Department of Health, Education, and Welfare.

Lathes, milling, grinding and drilling machines, and related equipment which is currently becoming excess to government requirements will be distributed. Junior high schools, high schools, technical schools, and colleges and universities will benefit by the program. School officials should make known their machine tool educational requirements to the director of their state agency for surplus property.

"This is getting to be a white-collar job"

Of course foundries will need engineering assistance. For example, here are just a few of the engineering principles applied daily in foundries everywhere.....

GATING & RISERING	Fluid Flow	Solidification
	Bernoulli's Theorem	Nucleation and
	Hydraulic Principles	Crystal Growth
	Feeding Range	Heat Transfer
	Surface Tension	Temperature Gradients
MOLDING	Sand Characteristics	Permeability
	Clay Minerology	Thermal Conductivity
	Solidification Rates	Compaction
	Colloidal Chemistry	Flowability
	Adhesion and Cohesion	Heat Extraction
MELTING	Combustion	Reaction Rates
	Thermodynamics	Equilibrium Constants
	High Temperature Laws	Free Energy Equations
	Heat Balances	Solubility Principles

As you know, well trained foundry engineering talent is in short supply. Where are you going to get these men when you need them? The answer is this: You can help create a pool of foundry engineering talent by participating in the F.E.F.'s educational program. Write today for our booklet, "Let's Look Ahead."

Foundry Educational Foundation

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The Foundry Educational Foundation does not pay for this advertising. This space has been contributed by FOUNDRY magazine in support of FEF's constructive program for foundry industry progress through education.

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Concluding Reports on

AFS TECHNICAL SESSIONS

See the July issue, pp. 168-188, for resumes of papers presented at the AFS Congress in Cleveland on the subjects of Gray Iron, Malleable Iron, Steel, Core and Molding Sand, Foundry Management, and Fundamentals

A PANEL discussion on the subject "Education and Our Industry's Survival" and the showing of a 25-minute, sound-color moving picture of the same title featured the single education session on the technical program.

The movie originally was produced in silent form by Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, and sound was added later with AFS funds. Designed for showing to students, primarily those in vocational and secondary schools, and to other groups, the movie describes uses of castings and the place the foundry industry holds in the American economy. I. H. Dennen, Beardsley & Piper, introduced the presentation and explained the purpose of the movie.

Members of the panel included George K. Dreher, Steel Founders' Society of America, Cleveland; Charles F. Walton, Gray Iron Founders' Society, Cleveland; James H. Lansing, Malleable Founders' Society, Cleveland; Chester V. Nass, Beardsley & Piper Div.; and Edward J. Walsh, Foundry Educational Foundation, Cleveland.

Mr. Lansing pointed out that it is at least as important to the foundry industry to have casting-conscious men in its customers' plants as it is to have them in its own. Men who do enter a foundry have great opportunities for advancement. The industry's size is such that opportunities are continuing. Advancement and opportunity are necessary to insure that good people are obtainable.

The problem of education in the foundry industry is as difficult as it is important, Mr. Walton said. He noted that the U. S. never has had an adequate apprentice training program in the foundry field. At one time there was a constant influx of trained men from Europe, but it ended in the 1930s.

We want to appeal to bright, eager, young men, and we are not likely to get them today as apprentices. They will want to go to college. On the other hand, young men who want an immediate job are after a well paying one, and such persons are not likely to enter a long, low-paid apprenticeship. In any event, good apprentice programs are few. It is at once the jobbing foundry which is likely to need apprentices and is the least likely to establish a training program. The modern trainee needs specific, technical training, and in most instances a foundry is not the place to offer it.

The foundry industry has gone beyond a simple need for molders and coremakers, according to Mr. Dreher. Where apprentice programs are set up, trainees should be capable of high school work. Many foundry skills require a high school education. Conventional apprentice-type training does not offer enough continuity.

The industry must go beyond apprentice training and traditional molding-coremaking training. To move ahead, it must provide a unit system of educational progress which will offer special training in various areas.

Mr. Nass stated that the Foundry Educational Foundation, which operates in the educational area beyond secondary schools, has been a tremendous aid to the foundry industry, even though it has not been so well supported as it should have been. The foundry industry has been willing to permit other industries to take the cream of the crop for employees, and it often has had to take the poorer prospects who were left over.

A promotional job must be done, first in our own industry, then to boys before they go to college. It must get to parents and counselors, too. The public generally is ignorant of the foundry industry, and some of the people who know it aren't enthusiastic about it. The future and the survival of the in-

A panel discussion of "Education and Our Industry's Survival" featured the single education session on the technical program. Left to right are A. F. Pfeiffer and I. H. Dennen, chairman and cochairman respectively, and panel members C. F. Walton, G. K. Dreher, C. V. Nass, J. H. Lansing, and E. J. Walsh.

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dustry depend on prompt, effective action.

Mr. Walsh closed the panel discussion with concise summaries of the remarks of each speaker.

During a discussion period, it was stated that much of the educational progress of the industry has been forced on it by the demands of its customers.

Education, it was said, can help foundries to keep their markets by aiding them in their efforts to produce the best possible product at the lowest possible reasonable price.

It also was noted that although the educational activities of the industry need development, they already are far ahead of the attitudes of foundry management.

HEAT TRANSFER

TWO SESSIONS, one devoted to a panel discussion, were given over to the subject of heat transfer.

The Relationship of Interface Temperature and Solidification by Victor Paschkis and J. W. Hlinka, Columbia University, New York. Presented by Dr. Paschkis. Because a previous study showed that the value of the interface temperature between melt and mold has a marked effect on the rate of solidification, a study was made of the influence of interface temperature. Work to date has covered only pure metals rather than alloys.

A generalized chart was developed which permits the determination of the total freezing time for a large slab (no end effects) of any pure material or eutectic alloy cast in a mold of any material whose outer surface does not lose heat appreciably during the solidification time, provided the conductivity of the solid casting is twice that of the liquid. This latter assumption probably holds for many metals.

Ladle Heating in the Foundry by R. B. Renda, Purdue University, West Lafayette, Ind., and W. M. Zeunik, National Malleable & Steel Castings Co., Indianapolis. Presented by Mr. Zeunik. This study of methods of heating pouring ladles made use of a 250-lb ladle having a 1½ to 2 in. lining. Premixing and aspirator type burners placed in different positions were employed. The latter type, with the flame directed so that the ladle was able to trap the maximum products of combustion, gave the quickest heating to highest temperature at lowest cost.

Heat Transfer in the Foundry—A question-and-answer session presided over by W. K. Bock, National Malleable & Steel Castings Co., Cleveland. The general topic was introduced by R. W. Ruddle, Foundry Services Inc., Columbus, Ohio, and the following were other panel members: Victor Paschkis, Columbia University; Charles K. Donoho, American Cast Iron Pipe Co., Birmingham; R. C. Shnay, Canada Iron Foundries Ltd., Toronto, Ont.

Subjects discussed covered a wide range, including the mechanics of graphite formation in gray iron, methods of adjusting the rate of heat transfer of mold materials, influence of solidification rate on formation of hot tears, and heat transfer problems in heat treatment of castings. On the subject of topping material for the retention of heat in open risers, one suggestion was the use of old auto headlight reflectors. When properly focused over a riser they are said to be three times as effective as any topping material in retarding heat loss.

SAFETY and HYGIENE

HEALTH AND WELFARE of production workers as well as intelligent use of exhaust system modifications were considered at the one safety and hygiene session.

Noise-Induced Hearing Loss, by Dr. E. L. Walsh, International Harvester Co., Chicago. Establishment of a noise control program by management protects the worker from possible deafness and the employer from future liability. Audiometric examination, given at time of employment to determine already existing hearing loss, should be followed by re-examination at 3 to 12 month intervals to evaluate possible damage. A noise survey of the work area is an important part of the program. Duration and distribution of noise levels and exposure during a typical work day must be noted, and intensity and duration of exposure at the work area must be designated.

Redesign of equipment to provide fewer striking or vibrating parts, substitution of non-vibrating materials for metallic parts, timing a process to off-shift periods, or use of sound-absorbing or deflecting media may be used to reduce noise sources and exposure. Ear plugs should be considered as important as safety glasses in critical areas.

Radiation Protection Problems in Industry, by A. F. Cota, A. O. Smith Co., Milwaukee. Wider use of radioactive materials for industrial purposes makes it important to understand the possible health hazards attending their use. All operating personnel must be trained in use and handling of radioactive sources. They must be acquainted with the hazards created through mishandling or carelessness, instructed in the use of monitoring devices, and taught to arrange work, shielding, and warnings so as to obviate exposures to uninformed or negligent personnel working near radioactive areas.

In use of high-activity sources, the most practical monitoring and radiation surveying devices are the dosimeter film and the ionization chamber. The blood count is effective as a check on other monitoring, and then only when related to previous count records and to the general health of the individual.

Barriers of lead, steel, concrete, and even water offer shielding from radiation. Hot areas should be anticipated and posted with radiation warning signs and flashing lights. These levels should be checked during the trial run.

Dust Piping Modifications To Prevent Material Buildup and Wear, by R. C. Ortgies, American Air Filter Co., Louisville, Ky. In foundries, the main link between the manufacturing equipment and dust control is the dust piping system. In addition to compliance with fixed regulations, the system must have elbows which eliminate wear and plugging. Duct connections should be readily removable. A system must be designed to eliminate plugging where moisture-laden air and dust is handled. Proper placement of duct connections with

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Pangborn Rotoblast Steel Shot

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large transitions is most desirable.

To overcome holes appearing in elbows, and plugging from grease, etc., slotted elbows have been effective. By saw cutting ¼-inch slots in the outer surface, the indraft air raises and deflects the dust, preventing contact with the elbow's outer perimeter. Sand mixer ventilation can be improved by bleeding in room air at a point above the hood. Where moisture content and dust loads are not too severe, a system where lesser quantities of bleed-in air are required, can be installed.

Elevators often are victims of improper placement of duct connections. Use of side connections is an improvement over the common practice of installing the ventilation duct on the head of the elevator discharge chute. Venting duct connections for rotary screens can be improved by addition of transitions. A large transition reduces velocity and eliminates sand carry-over. To prevent condensation in sand bins during shutdown periods, use of a stub stack vented to the foundry proper, overcomes the difficulty. Satisfactory results have been obtained by doubling the amount of stub vents and utilizing muller type connections.

PLANT EQUIPMENT

PREVENTIVE MAINTENANCE was discussed at a session on plant and plant equipment. **Prevention by the Ounce**, by F. J. Dost and G. P. Ribar, Sterling Foundry Co., Wellington, Ohio, related specific programs for maintenance of electrical, material handling, and melting equipment, fuel-burning appliances and compressed air systems.

Believing that keeping lubricant in keeps dirt out, lubrication was stressed. Cleaning and inspection also are important in preventive maintenance. Cleaning electric motors and controllers and other equipment by use of compressed air blow pipes at regular intervals reduces possibility of breakdowns.

Establishing an Effective Preventive Maintenance Program, by W. Huelsen, Caterpillar Tractor Co., Peoria, Ill., points out that this is obtained by planned application of several logical steps. Equipment is listed in order of importance. Necessary maintenance data on each are obtained from manufacturers or their catalogs, and from them schedules are prepared.

Information is listed on cards distributed to maintenance supervisors on each shift according to time scheduled. After operations are performed, the cards are returned to the general supervisor of maintenance in charge of all shifts. This type of maintenance program enables operatives to keep a close check on equipment, and make minor repairs to forestall breakdowns.

INDUSTRIAL ENGINEERING

TWO SESSIONS dealing with industrial engineering were presented during the AFS Congress.

A novel presentation of **An Approach to Work Simplification** was made by C. A. Hanson, Deere & Co., Moline, Ill., who used feats of magic to hold the attention of his audience and to illustrate his points.

Work simplification represents an attitude, a willingness to stop and look at what you are doing and question each phase of an operation. This keeps the individual and company abreast of current developments by a systematic attack on every-day problems.

At Deere & Co. the work simplification program consists of 13 meetings for supervisory and management people and a follow-up program on completion of the course.

Mr. Hanson then showed a series of cards with common phrases printed on them. Six or seven people read these phrases before one in the audience discovered a mistake in the wording of the phrase. It developed that all cards carried similar mistakes and they had been overlooked—proving his point that it is necessary to take a close look at things we are familiar with. Such illustrations help stimulate thinking, and those taking the course will be pulling in ideas themselves.

Among various attention-getters used in Deere & Co. training classes is a large stop-and-go sign. When the red light is on, negative responses such as "It won't work, we've tried it before, or it'll cost too much money" show up. The green light indicates constructive suggestions. Another is a cartoon character called Yahbut. He is named for a common reply for suggestions on procedure changes, "Yeah, but." After the course has been completed, students receive pencils, memo pads, cigarette lighters, etc., with a stoplight imprinted as reminders to keep an open mind and to look at all jobs with a questioning thought.

Deere & Co. teams include a representative of top management as chairman and two representatives from clerical positions and mechanical operations. The teams meet once a week at a definite time, continuing to work on projects until plant management requests they be discontinued.

John Taylor, Norris & Elliott Inc., Columbus, Ohio, presented a film, **Effort Rating**, designed for training new timestudy men and occasionally for checking the ratings of experienced timestudy engineers. The film was shown once and then rerun to permit the audience to check its judgment in effort rating with the rates established by averaging those of a number of professional timestudy engineers who had analyzed the film.

Practical Application of the Work Sampling Technique—J. N. Capretta and R. M. Kennan, International Harvester Co., Chicago, was presented by George Harper of that company.

Jobs formerly difficult to analyze, such as laborers, cupola tenders, cupola repairmen, truck drivers, etc., now can be measured easily. Methods are not questioned in work sampling, but it is well to establish good practices before samplings are undertaken. Similar to quality control, work sampling requires random selection of times for observations to chart the time that either man or machine is occupied. Observations should be made of an entire work cycle on a normal mix of jobs by a regular operator.

A film prepared under the direc-

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Pangborn engineering is important to every dust-producing plant, regardless of the kind of collector needed. It is not enough to put a dust collector within a plant. An efficient dust collecting system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

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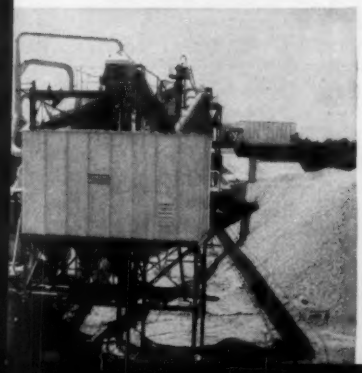

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *1400 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

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tion of Prof. Ralph Barnes and issued by the University of California, Berkeley, Calif., was shown which explained the random work sampling method of measuring working and idle time. Also, it is possible to rate the performance of workers during the same observations, thus making a tool for measuring and analyzing work and setting standards for the operation. An advantage of work sampling is that it is possible to study group activity on a nonstandardized job. No stop watches are needed and work can be measured in less time and at lower cost.

Mr. Harper pointed out that statistical charts are available to predict normals and indicate higher percentages of idle times. Accuracy is determined by the number of observations taken, and since cost of work sampling is determined by the number of observations, tolerances should not be closer than necessary.

One example was cited where work samples were taken to compare performance of piece workers and day workers. Day workers' costs were up and the study indicated 35 per cent of their time was idle, thereby permitting a substantial reduction in day work.

International uses people trained in a three-day work sample course to make observations. A person commenting from the floor stated that it had been recommended that line supervisors take the observations. Mr. Harper agreed this was the ideal method, if the supervisor has available time. First, because it is necessary to know the operation of the department thoroughly; and secondly, it is advantageous that the supervisor know where weak spots are in his department.

BRASS and BRONZE

TWO technical sessions, a seminar, and a roundtable luncheon made up the program for brass and bronze foundrymen. Topics covered included chemical treatments, deoxidation practice, porosity, leakage, sands for brass castings, centrifugal casting, new alloys, casting redesign, and what casting buyers expect.

The Chemical Treatment of Copper Alloys by R. W. Ruddle, Foundry Services Inc., Columbus, Ohio. Chemical treatment is used to reduce melting loss, eliminate dross inclusions, remove gases, and refine grain structure. Melting losses vary with type of furnace and quality of melting practice, but can be as much as 2 to 4 per cent in gun metal even with good practice. Chemical treatment with cover fluxes can cut these losses to one-fourth to one-half as much and also can be used to remove impurities in the melt. With alloys that form oxide films, melting losses are relatively low if the melt surface is not disturbed, but it is difficult not to disturb it.

Gas can be removed by purging with inert gas, but such purging offers some problems. Deoxidizing fluxes are easily used and are effective. Steam vapor porosity can be eliminated by an oxidation-reduction treatment. The amount of deoxidizer required depends on the oxidation of the melt. Grain refinement can be produced in many copper alloys by (depending on the alloy), additions of iron, boron, and other elements.

Use of any type of chemical treatment requires considerable experience and knowhow.

Deoxidation Practice for Copper Shell-Molded Castings by R. C. Harris, Arwood Precision Casting Corp., Los Angeles. Studies conducted at Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, indicate that deoxidation is more critical for shell-molded copper castings than for those produced by other methods. The large percentage of resin in the shell mold material generates large volumes of gaseous decomposition products when heated. These gases are highly reducing in nature and presumably are rich in hydrogen, which reacts with any oxides in the copper to form steam and subsequent embrittlement of castings. Embrittlement is caused by rupturing of grain boundaries.

Four deoxidizers were investigated: Lithium, titanium, phosphorus, and calcium boride. Only titanium and lithium effectively deoxidize pure copper for casting into shell molds.

Both gas-fired and high-frequency (20,000 cps) induction melting equipment are satisfactory for melting pure copper.

In a seminar on **What Is Expected of a Casting,** W. F. Straight, Bethlehem Steel Co., Quincy, Mass., discussed **Casting Redesign.** He described a number of parts that had been converted to castings from other methods of manufacture at a cost saving. Casting can improve appearance of a part as well as reduce cost. Application of good foundry practice and attention to details is as important as redesign to produce a good part.

J. W. Foster, Ingersoll-Rand Co., Phillipsburg, N. J., talked on **Casting Purchasing.** Those who buy castings are governed by four basic principles: 1. quality—a part must meet the use for which it is intended. 2. price—must be competitive with other materials and methods as well as with other castings. 3. delivery—as promised. 4. service—buyers expect all things pertaining to doing a good job for customers. These include prompt answers to inquiries and correspondence, design assistance, and the satisfactory handling of complaints. As a buyer, the speaker has had difficulty in getting desired quality castings from foundries.

Effects of Foundry Variables on Porosity of 85-5-5-5 Bronze by R. A. Flinn and C. R. Mielke, University of Michigan, Ann Arbor, Mich. Pouring temperature and the use of chills have a marked effect on porosity in castings. Moisture variations in green sand were found to have minimum effect. Sound castings can be produced by determining the optimum pouring temperature, usually in the low range, and adjusting the gating system accordingly. Chills can be used to displace porosity from the critical areas of castings.

Occurrence and Elimination of Leakage in a Gun Metal Casting by M. Glassenberg, Armour Research Foundation, Chicago; A. H. Hesse, R. Lavin & Sons Inc., Chicago; and W. H. Baer, Bureau of Ships, Navy Department, Washington. Presented by Mr. Glassenberg. Factors which influence porosity in a ring-type suction head casting poured in gun metal were studied. Gating system, melt quality, pouring temperature, and use of chills were considered. Pressure tightness was improved by using a ring-type runner system in the drag that decreased progressively in cross-sectional area past each gate. Porosity was not eliminated, however, in the outer flange of the casting. Use of a full, round, gun metal chill coated with graphite wash and placed in the core forming the flange resulted in

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a sound flange and a pressure-tight casting.

Use of Oil-Bentone Sand for Higher Quality Finish in Brass and Bronze Castings by O. E. Johnson, H. B. Ives Co., New Haven, Conn. Two years of experience with molds made with round-grained, 190-fineness sand bonded with a proprietary mix consisting of Gulf Coast oil, alcohol, and prepared bentonite was described. The company makes hardware parts, using aluminum matchplates molded on the bench. Prime requirement of these castings is a smooth finish, which is obtained. Although as-cast parts cost about four times those produced by previous molding methods, the company saved 14 times the cost of previous cleaning and polishing. Total saving is about seven times previous cost. Comparisons are based on one year's experience with each molding medium.

Discussion at the brass and bronze roundtable luncheon was centered around **New Developments in Copper-Base Alloy Casting Methods.** Victor M. Rowell, Harry W. Dietert Co., Detroit, talked on **Sand Molding.** Such molds contain a major percentage of sand, including shell molds. A recent trend in green sand practice is to use synthetic sand which can be rammed hard to get close dimensional control. Moisture content of such molds can be held down by using more efficient clays, thus necessitating less permeability. Good patterns are as important in green sand work as in shell molding.

Centrifugal Casting by Nathan Janco, Centrifugal Casting Machine Co., Tulsa, Okla. The author described development of centrifugal casting from the use of sand-lined molds to the current use of graphite and steel, water-cooled molds which are spray coated before each cast. Development work now is under way for a coating that will produce several castings. Copper-base alloys have been centrifugally cast into parts weighing from a few pounds to 20 tons. In ferrous foundries, the centrifugal casting of steel parts is growing.

New Alloys by G. L. Lee, International Nickel Co., New York. Several new alloys were discussed with emphasis on recently increased usage of nickel-tin bronzes, nickel-aluminum bronzes, and cupro-nickels.

DIECASTINGS

THE FIRST diecasting program ever presented at an AFS Congress consisted of two sessions and a roundtable luncheon held in conjunction with the Light Metals Division program. Automatic pouring, vacuum diecasting, aluminum melting practice, and British diecasting and permanent mold practices were discussed.

At the roundtable luncheon, automatic ladling of light metals was covered by a panel which included R. C. Haverberg, AC Spark Plug Div., General Motors, Flint, Mich.; C. H. George, Western Electric Co., Baltimore; and H. Eriksen, Chrysler Corp., Kokomo, Ind.

Each of the speakers discussed the types of automatic ladling equipment available and described his company's experience with them. Advantages include elimination of variables in hand ladling, safer operation, and reduction of operator fatigue. The process is most advantageous for larger castings—in general from 5 to 8 lb and up, depending on casting complexity and cooling time.

Use of automatic ladling can require extensive changes and innovations. Factors to be considered, primarily from a financial viewpoint, include equipment on hand, operating problems, labor, casting size, and similar matters.

Die and Permanent Mold Casting of Nonferrous Metals in the United Kingdom by L. J. Brice and G. A. Broughton, Ministry of Supply, England. Presented by Mr. Brice. In general, United Kingdom practice is similar to that in the U. S. Automatic ladling and vacuum melting and casting are in the development stage and hold considerable promise. Progress has been made in material handling, and one new installation has reduced handling 90 percent, production space 50 per cent, job through-time 85 per cent.

Aluminum Melting Practice in the Diecasting and Permanent Mold Fields by J. P. Moehling, Stroman Furnace & Engineering Co., Franklin Park, Ill. Development of diecasting machines has created the need for similar development in melting and holding furnaces. Demands may go as high as 2100 lb of aluminum per hour, whereas a short time ago it was for amounts from 100 lb per hour and up.

Iron pot furnaces were used originally, but could not be adapted to all demands. They were followed by crucible and stack-charging reverberatory furnaces, then by centralized melting units in the form of tilting-type reverberatory furnaces. Companies with a large demand for metal also use "box-type" smelting reverberatory units. Dry and wet-hearth furnaces and electric melting also have come into use. Each of the various types has its advantages for particular applications, and each presents its problems in operation and maintenance.

Experiences in Nonferrous Diecasting Die and Permanent Mold Life by G. Otto, Maytag Co., Newton, Iowa. Die cost per piece translates die life into dollars and cents. Die life depends on such factors as die maintenance, die lubricants, die material, mold coatings, etc. The most repetitive type of die maintenance is due to soldering of aluminum on the steel die. The less the draft on dies, the more severe the soldering.

Practice has been to specify SAE-AISI H-13 hot work tool steel hardened to 44-48 Rockwell C hardness for aluminum and zinc diecasting dies, but a cast iron material has been used on permanent molds. Experiments have indicated that longer life can be obtained by use of cast-to-shape, unhardened hot work steel in place of the cast-to-shape cast iron molds.

Stainless steel rod (300 series) is used for die welding repair because of its compatibility with the parent metal and the fact that it will work harden to give good wear resistance. The major problem with welded dies is the formation of gas porosity in the bead. Such a defect requires grinding out and rewelding.

Mold coatings and die lubricants have a definite effect on extension of mold life in addition to facilitating casting release. Where die construction does not permit use of internal cooling lines, water spraying sometimes can be used to cool the die and reduce soldering. Die temperature also is important to die life. Every attempt should be made to hold an aluminum diecasting die at 400° F to hold down soldering.

Melting Practice for Aluminum Casting Alloys by W. N. Brammer, Apex Smelting Co., Cleveland. Aluminum's tendencies to absorb hydrogen and to oxidize require

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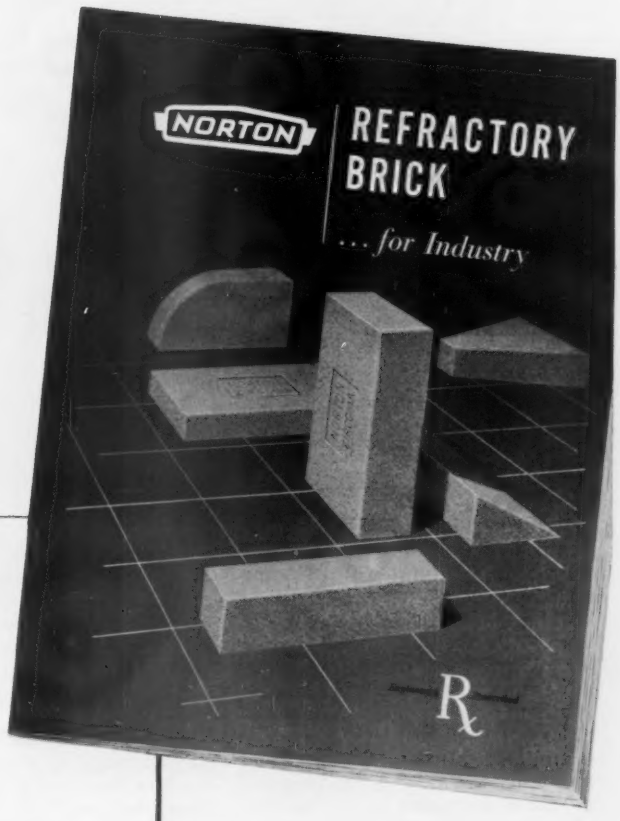

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All essential details are listed, such as: how each material is produced . . . important properties, characteristics and chemical analyses . . . shapes of brick and other molded products that are available . . . representative applications . . . packing methods that assure safe arrival.

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careful consideration during melting.

Open-hearth furnaces are efficient and inexpensive for melting and direct ladling. Crucible furnaces are good for metal breakdown, after which the metal must be moved to a holding furnace. Induction furnaces have high initial cost, but are very efficient and operate at low cost.

Metal and melting often are blamed for difficulties when the fault is poor temperature control at the pouring station, contamination of metal, poor tool maintenance, or some other factor. With iron crucibles, care must be taken to avoid iron contamination; proper care of crucibles also increases pot life. To avoid metal contamination, ingot should be kept clean and dry. Overheating a melt increases gassing tendencies, and underheating fails to get the alloy in solution. Fluxes do a vital job.

Progress in Vacuum Diecasting by D. Morgenstern, Nelmor Mfg. Co., Euclid, Ohio. The vacuum diecasting process has been accepted as a new and valuable tool for production of better diecastings. It eliminates the problem of entrapped air in a die, a condition which can cause poor finish, porosity, sink marks, and the need for higher injection pressures. Hot chamber vacuum diecasting of zinc is an established fact, and cold chamber vacuum diecasting of aluminum now is coming out of the testing stage.

LIGHT METALS

NEW ALLOYS of aluminum and magnesium, reactive metals, melting practice, the control and effect of cooling rate, test bar mold design, and die casting were discussed by light metals foundrymen at five technical sessions and a luncheon.

Problems Encountered in Casting Reactive Metals—W. A. Aschoff and D. H. Blair, Oregon Metallurgical Corp., Albany, Oreg. Presented by Mr. Aschoff. Reactive metals are those which have an affinity for contamination at elevated temperature by oxygen, nitrogen, and hydrogen. A minimum of contamination is encountered when melts are prepared in the water-cooled copper crucible of a consumable electrode vacuum air furnace.

The main problems encountered in castings production are porosity and temperature control. Porosity can be reduced by using vacuum-produced alloys for remelting and pouring directly into heated molds in a vacuum. Molds made from rammed graphite cost less than those machined from graphite blocks.

Because of high melting temperatures involved, thermocouples and optical pyrometers are useless for temperature control. Control may be achieved by regulating current input and time to get reproducible results, although the exact temperature may not be known.

A Casting Technology for Reactive Metals—F. W. Wood, S. L. Ausmus, and E. D. Calvert, U. S. Bureau of Mines, Albany, Oreg. Presented by Mr. Wood. Zirconium and hafnium alloy castings weighing up to 200 lb have been produced. Reaction with rammed graphite molds was three times greater than that obtained in machined graphite molds.

In the control of melting furnace performance electrode size was found to be insignificant, also that an optimum current amperage pertains at a given ladle size and furnace pressure, and lower vacuum chamber pressure gives better results.

It was concluded that good quality castings in a variety of shapes can be produced in a vacuum chamber, but cost still is too high for volume production.

Foundry Characteristics of a Rammed Graphitic Mold Material for Casting Titanium—H. W. Antes, R. E. Edelman, and J. T. Norton, Ordnance Corps, Frankford Arsenal, Philadelphia. Presented by Mr. Antes. Test results indicate that satisfactory titanium castings can be made in expendable graphite molds made by common foundry techniques and equipment. Permeability, strength, thermal conductivity, surface finish, and shrinkage of these molds can be varied by controlling water content and molding pressure. As water content and molding pressure go up, strength and thermal conductivity increase and permeability and shrinkage decrease. Surface finish improves with decreased moisture and increased pressure.

A satisfactory molding mixture consists of the following materials in percentages by weight: 64.5 graphite powder, 12.2 starch, 9.5 carbonaceous cement, 6.4 pitch, 6.4 water, and 1.0 surface activating agent. It should be formed into molds with a minimum molding pressure of 100 psi.

A Method of Casting Radiator-Type Fuel Elements for a Nuclear Reactor—A. W. Hare and R. F. Dickerson, Battelle Memorial Institute, Columbus, Ohio. Presented by Mr. Hare. These elements were 2 and 4 in. high and 3.9 in. wide with 397 perforations. They were cast successfully with vacuum induction-melted chromium-uranium eutectic alloy at 2000° F into a machined graphite mold heated to 1600° F. The mold was of three parts: Cavity assembly, feeder assembly, and retaining cup. Cores were $\frac{1}{8}$-in.-diam stainless steel rod sprayed with a 10-mil coating of magnesium oxide slurry.

Effect of Impurities on the Resistance to Corrosion of Magnesium Casting Alloys AM262 and AM266—B. J. Nelson, Aluminum Co. of America, New Kensington, Pa. Metal samples were exposed to salt and industrial atmospheres. Losses in mechanical properties resulting from corrosion were greater for samples dipped in acid than for those which received a chrome pickle. Molding methods apparently had no effect on resistance to corrosion.

A written discussion prepared by Harold Robinson, Dow Chemical Co., Midland, Mich., expressed the opinion that the study was designed to show magnesium in a poor light.

Some Requirements for Successful Fluidity Testing—S. A. Prussin, Pacific Semiconductors Inc., Culver City Calif., and G. R. Fitterer, University of Pittsburgh. Presented by James G. Bassett, University of Pittsburgh. Study indicated that a reservoir fluidimeter design permits fluidity test rods to be cast under constant and reproducible metallostatic pressure. Since cessation of metal flow in the mold occurs in less than a second, it is impossible for a commercially gated mold to be independent of the human variable.

Variations in length of test rod under identical metal and mold conditions were attributed to one of two mechanisms of flow cessation: Freezing of layers of metal at the tip of the metal stream, and freezing of metal along the flow channel behind the tip.

During the discussion period, Walter E. Sicha, Aluminum Co. of America, Cleveland, said that fluidity tests in the aluminum field are almost useless. Raising the temper-

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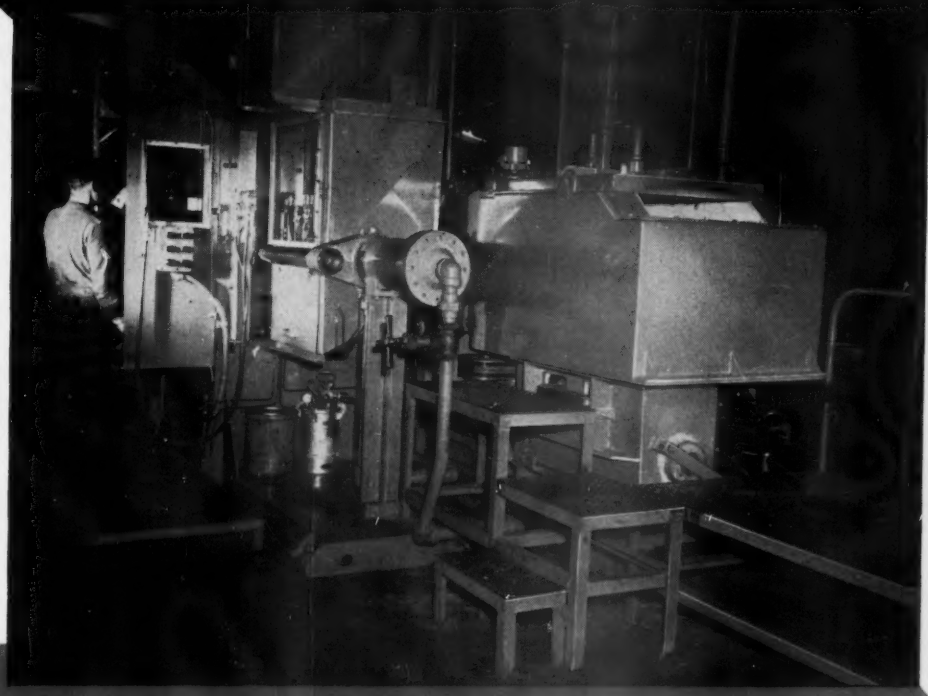

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Circle 632 on Page 103

ature of an aluminum melt 10 to 15 degrees compensates for other factors affecting fluidity.

An Improved Design for Cast Tensile Bar Molds—M. Karnowsky, Sandia Corp., Albuquerque, N. M. Principles of gating developed during recent studies at Battelle Memorial Institute were applied to a test bar mold constructed of Lucite. Results indicated improvement in cast tensile bars.

New Aluminum-Magnesium-Zinc Casting Alloy—H. C. Rutemiller, Aluminum Co. of America, Cleveland. New sand casting alloy X250-T4 retains the good properties of 220-T4 but eliminates some of the less desirable characteristics. The new alloy has high resistance to stress corrosion and retention of high ductility during natural aging. It does not require special quenching techniques to impart high tensile strength. Suggested applications are for aircraft structural parts, construction or mechanical equipment subject to impact loads, in equipment for the dairy, food, and chemical industries, and for parts requiring resistance to industrial and marine atmospheres.

High-Strength Aluminum Alloy X357, Properties and Aging Practices—A. B. DeRoss, Kaiser Aluminum & Chemical Sales Inc., Chicago. New alloy X357, basically an aluminum-silicon-magnesium type, has good castability, machinability, dimensional stability, and corrosion resistance. Its high tensile and yield strengths with good ductility are developed by solution heat treatment and artificial aging. Established foundry techniques are used in melting, fluxing, and pouring. Application of the alloy is suggested for highly stressed parts where high yield strength is important.

Foundry Practice for Sand Casting Commercially Pure Aluminum—M. V. Davis and R. V. Scalco, Anderson Electric Corp., Birmingham. Presented by Mr. Scalco. The foundry's techniques in producing commercially pure aluminum, high electrical conductivity sand castings were described. Problems encountered in casting pure aluminum include: 1. Difficult feeding due to a solidification range of 25° F and 6.6 per cent shrinkage. 2. Hot shortness of metal requiring good casting design and core practice. 3. Ease of hydrogen adsorption on molten metal surface, requiring close attention to melting practice. 4. Low mechanical strength, requiring careful shakeout procedures and subsequent handling. 5. The soft aluminum causes galling, seizing, and loading of saws and abrasives used to remove gates and risers.

These problems can be overcome by adherence to good foundry practice, and sound, pure aluminum castings can be produced as easily as those in common aluminum alloys.

Tensile Properties of Microshrinkage-Graded AZ63 Magnesium Alloy—J. D. Grimsley and I. J. Feinberg, U. S. Naval Ordnance Laboratory, White Oak, Silver Spring, Md. Presented by Mr. Feinberg. Magnesium alloy AZ63 having microshrinkage of 6 degrees was tested. Microshrinkage usually was found in poorly fed casting areas in localized form. Tensile strength and elongation were reduced as the amount of shrinkage increased. Only a small effect was noted on yield strength. It was concluded that microshrinkage is detrimental to all properties to a greater or lesser degree.

Induction Melting in a Magnesium Foundry—J. G. House and M. E. Brooks, Dow Chemical Co., Bay City, Mich. Presented by Mr. House. Operation of a channelless line-frequency induction furnace rated at 450 kw and equipped with a cast steel crucible of 1300 lb magnesium capacity was described. Its operating characteristics were compared with those of a gas-fired tilting furnace as to melting rate, metal loss, flux consumption, fuel consumption, and labor. It was concluded that the induction furnace compares favorably with the gas-fired furnace under production conditions.

Release of Hydrogen from Molten Aluminum—A. Pal, Annapurna Metal Works, Calcutta, India, and H. M. Davis, Pennsylvania State University, University Park, Pa. Presented by Mr. Davis. A degassing briquet with specific gravity higher than aluminum so that it sinks to the bottom of the melt was developed. It produces a flushing gas at 1292° F and does not contaminate the melt. It consists of magnesium oxychloride mixed with aluminum oxide for weight and a binder. The magnesium oxychloride is made by mixing magnesium oxide and magnesium chloride with water and drying the mix. The briquets removed a significant proportion of hydrogen from aluminum melts.

Improvement of Castings by Press Forging—A. H. Murphy and W. Rostoker, Armour Research Foundation, Chicago, and L. L. Clark, Fansteel Metallurgical Corp., Muskogee, Okla. Presented by Mr. Murphy. Tests were conducted on

At the third light metals session, four papers were presented. Three dealt with properties of alloys and the fourth with sand casting commercially pure aluminum

aluminum alloys 356 and 220 and magnesium alloy AZ92. Results showed 25 to 70 per cent increase in yield and ultimate strengths of castings by either cold or warm compressive deformation of 10 to 30 per cent. Some ductility in the aluminum alloys, however, was lost.

Similar strength gains and loss of ductility can be achieved by unconventional heat treatment of 356 alloy. In general, it was concluded that press forging of castings may be applied advantageously to alloys which are not heat treatable or only moderately so.

Performance of Chills on High-Strength Magnesium Alloy Sand Castings of Various Section Thickness — M. C. Flemings, R. W. Strachan, E. J. Poirier, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Presented by Dr. Flemings. The use of chills refined the grain size and increased properties in sections cut from test castings poured with AZ91C and AZ92A alloys. Sections from unchilled castings had 24,200 psi ultimate strength, 16,500 psi yield strength, and 1 per cent elongation. Sections from chilled castings had 43,500 psi ultimate tensile strength, 23,800 psi yield strength, and 3 per cent elongation.

Rigging Design of High-Strength Magnesium Alloy Castings—M. C. Flemings, R. W. Strachan, E. J. Poirier, and H. F. Taylor, Massachusetts Institute of Technology. Presented by Dr. Flemings. Techniques of risering to produce chilled and unchilled gimbal castings were described. Chilling produced high tensile and yield strengths and elongation in castings sections greater than $\frac{1}{4}$ in. No practical improvement in properties was found in chilled thin sections.

Effect of Cooling Rate on the Grain Size of Magnesium Casting Alloys—R. D. Green, Dow Chemical Co., Midland, Mich. Grain size is established at a temperature close to the liquidus. When considering the effect of cooling rate on grain size, the rate through the temperature range from liquidus to the establishing temperature should be used rather than the rate through the entire solidification range. Grain size of magnesium alloys decreases as cooling rate increases to certain values. Further increases in cooling rate result in no additional decrease in grain size.

The Parlanti Mold Process for the Casting of Metal by Controlled Rate of Heat Transfer—C. A. Parlanti and R. D. Veneklasen, Niforge Engineered Castings Inc., Boston. Presented by Mr. Veneklasen. The process involves use of molds made from 356 aluminum alloy and anodized with aluminum oxide 0.0005 to 0.001 in. thick.

The molds are designed, using fins if necessary, to control the even cooling of a cast mass to obtain optimum physical test properties. Such molds have been used to accept molten metals at temperatures up to 3600° F. Aluminum, gray iron, nodular iron, steel, magnesium, and titanium castings have been poured successfully. Surface of the titanium castings was good, with no contamination.

Purdue Casting Conference Is Set for Oct. 30-31

Plans and program have been announced for the annual Metals Casting Conference to be held at Purdue University, West Lafayette, Ind., Oct. 30-31. This year the program has been expanded to cover items of interest to both ferrous and nonferrous foundrymen. Theme of the conference will be "Tricks of the Trade—Practical, Simple, Cheap."

Topics to be discussed include sand processing and handling, melting and fluxing, inoculation of irons, gating, nodular iron, cost concepts, and nondestructive testing. Program details follow:

Thursday, Oct. 30

10:45 a.m.—Panel Discussion: **Sand Processing and Handling.** Gray Iron and Malleable, Robert Clark, Dalton Foundries Inc., Warsaw, Ind. Nonferrous, John Fulwiter, Fabricast Div., General Motors, Bedford, Ind. General, T. W. Seaton, American Silica Sand Co., Ottawa, Ill. Chairman, T. E. Smith, Central Foundry Div., General Motors, Danville, Ill.

1:30 p.m.—**Melting and Fluxing of Nonferrous Metals,** Harry Ahl, Samuel Greenfield Co., Buffalo. Chairman, Robert Langsenkamp, Langsenkamp-Wheeler Brass Works Inc., Indianapolis. **Inoculation of Irons—Advantages and Control,** Ralph Clark, Electro Metallurgical Co., Cleveland. Chairman, Philip Semler, Auto Specialties Mfg. Co., St. Joseph, Mich.

3 p.m.—**Principles of Effective Gating—Copper and Aluminum Alloys,** J. G. Kura, Battelle Memorial Institute, Columbus, Ohio. Chairman, Roy Payne, Sterling Brass Foundry, Elkhart, Ind. Ductile Iron, Eric Welander, John Deere Malleable Works Div., East Moline, Ill. Chairman, Floyd Crowley, Benton Harbor Malleable Industries, Benton Harbor, Mich.

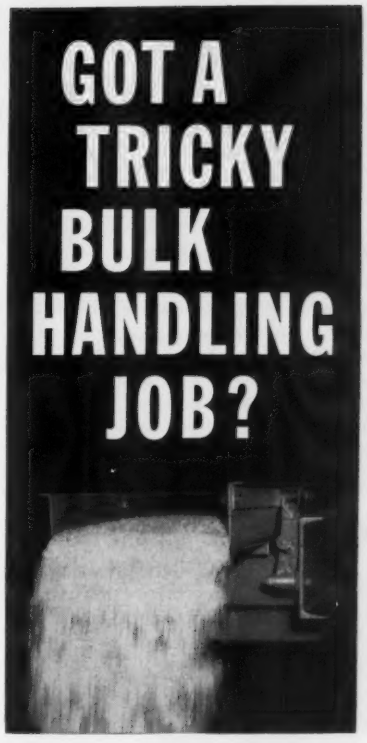
6 p.m. — Banquet: **New Developments and Thinking in European Foundries,** C. A. Sanders, American Colloid Co., Skokie, Ill. Toastmaster, R. W. Lindley, Industrial Engineering Dept., Purdue University.

Friday, Oct. 31

9:30 a.m.—**Practical Cost Concepts for Small and Medium Sized Foundries,** Ashley C. Sinnett, Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind. Chairman, Jack Sickman, Swayne, Robinson & Co., Richmond, Ind.

11 a.m.—**Non-Destructive Testing for Large and Small Foundries,** Harry Day, Auto Specialties Mfg. Co. Chairman, A. R. Lindgren Jr., Magnaflux Corp., Indianapolis.

1:30 p.m.—Panel Discussion: **Diversification for the Foundry—Means of Survival.** Diversification of Processes, Sam Hodler, Golden Foundry Co., Columbus, Ind. Diversifying the Customer, William Truckenmiller, Albion Malleable Iron Co., Albion, Mich. Need and Willingness To Serve the Customer, Walter A. Scott, Central Foundry Div. Chairman, C. T. Marek, Metallurgy Department, Purdue University.



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Circle 633 on Page 103

Literature for Foundrymen

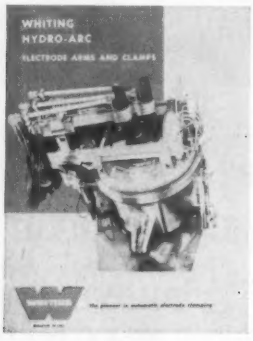
Alloys for Diecasting

Properties and industrial applications of high-grade zinc alloys for diecasting are described in 32-page booklet. Includes principally used specifications and thorough discussion of modern diecasting practice.—**Federated Metals Div., American Smelting & Refining Co.**, 120 Broadway, New York 5, N. Y.

For More Details Circle No. 474—Page 153

Electrode Arms and Clamps

Bulletin EF 100 details features of an automatic electrode positioning device for electric arc furnaces which



is said to reduce electrode breakage and consumption, refractory and current consumption, and maintenance costs.—**Whiting Corp.**, 157th and Lathrop Ave., Harvey, Ill.

For More Details Circle No. 475—Page 153

Fire Extinguishers

Brochure I-19 describes and illustrates carbon dioxide fire extinguishing systems, fire detection equipment, and contains a chart outlining the suitability of portable fire extinguishers on various types of fires. Ultrasonic and photoelectric burglar detection systems also are included—**Walter Kidde & Co. Inc.**, 675 Main St., Belleville 9, N. J.

For More Details Circle No. 476—Page 153

Coremaking Machines

Bulletin describes new core rollover and draw machines which work together or separately. They are economically installed in conveyor lines and provide the flexibility necessary for large core work. Machines are air-operated, and standardization of box sizes and shapes is unnecessary. — **Greenlee Bros. & Co.**, Rockford, Ill.

For More Details Circle No. 477—Page 153

Sandrammers

Well illustrated, 12-page bulletin describes four models of slinger type Sandrammer. Specifications, flask coverage, and typical applications in small and large foundries for both molding and coremaking are included.—**F. E. (North America) Ltd.**, 47 Advance Rd., Toronto 18, Ont., Canada.

For More Details Circle No. 478—Page 153

Shell Molding

Two new models of shell molding machines are described. One handles maximum shell size of 20 x 30 in., the other up to 26 x 40 in. Both offer improved drive units, curing ovens, and control systems.—**Hutchinson Shell Mold Co.**, 4131 Alby St., Alton, Ill.

For More Details Circle No. 479—Page 153

Hydraulic Cylinders

Bulletin JH-104N is intended as a practical textbook embracing all important aspects of use of hydraulic power cylinders. Includes data never before made available to designers and cylinder users.—**Miller Fluid Power Div.**, 2040 N. Hawthorne Ave., Melrose Park, Ill.

For More Details Circle No. 480—Page 153

Portable Tools

Pocket-size, 48-page catalog No. 85 gives specifications and illustrations of all of company's portable electric and air tools sold through industrial distributors.—**Thor Power Tool Co.**, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 481—Page 153

Industrial Gloves

Wall chart, measuring 17 x 22 in., displays the full line of the company's industrial gloves with specifications on material, weight, and size. A pocket folder gives instructions for selecting the correct glove for a given application.—**Pioneer Rubber Co.**, 296 Tiffin Rd., Willard, Ohio.

For More Details Circle No. 482—Page 153

Vibrating Feeders

Air-operated vibrating feeders available in lengths from 24 in. to 15 ft are described in Bulletin 1000. Feeders move from 250 lb of small metal parts per hour to 200 tons of damp sand per hour.—**Cleveland Vibrator Co.**, 2828 Clinton Ave., Cleveland 13, Ohio.

For More Details Circle No. 483—Page 153

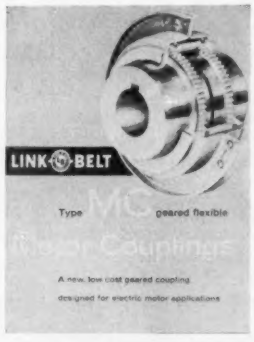
Shell Applicator

Universal liquid applicator for bonding shell molds is described in leaflet. Standard sizes are for 15 x 20 in. and 20 x 30 in. shells, with other sizes available on request.—Shell Process Inc., Bliss and Parkside, West Springfield, Mass.

For More Details Circle No. 484—Page 153

Motor Couplings

Folder 2875 details pertinent application and selection data for the company's new MC couplings, designed especially for use as a motor



coupling. Specifications and dimensions are detailed.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 485—Page 153

Foundry Truck

Bulletin No. 7000 gives specifications and details of design and operation of Beep industrial truck. Bucket and fork use is interchangeable.—**Beardsley & Piper, Div. of Pettibone Mulliken Corp.**, 2424 North Cicero Ave., Chicago 39, Ill.

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Shell Core Blower

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419 439 459 479 499 519
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FOR MORE INFORMATION on Equipment, Supplies, and Literature described in this issue, mail one of these cards.

●

small to medium size shell cores will accommodate coreboxes up to 4½ in. deep, 10 in. wide and 15 in. long.—Harrison Machine Co., Wesleyville, Erie, Pa.

For More Details Circle No. 487—Page 153

Industrial Heating

Pictorial bulletin shows the many gas, electric, and induction heating units available for various applications and processes. Includes equipment index for different processes and list of bulletins available on heating equipment.—General Electric Co., Schenectady 5, N. Y.

For More Details Circle No. 488—Page 153

Vibrating Screens

Design and construction features, installation methods, floor mounting arrangements, and dimensions for cable-suspended and floor-mounted horizontal, vibrating screens are contained in Bulletin 07B6330B.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

For More Details Circle No. 489—Page 153

Conveyors

Foundry applications of gravity and power conveyors are described in Bulletin 68. It also includes a description of a shielded type bearing designed especially for conveyor rollers installed in foundries. — Standard Conveyor Co., North St. Paul 9, Minn.

For More Details Circle No. 490—Page 153

Floor Material

Booklet presents test data which indicate the high strength characteristics of Monile, a monolithic floor surfacing material. Indoor and outdoor installations are illustrated. —Master Mechanics Co., 2097 Columbus Rd., Cleveland 13, Ohio.

For More Details Circle No. 491—Page 153

Pallet Boxes

Various products which can be handled in knocked-down wire-bound pallet boxes, and the economy and convenience they offer in handling, shipping, and storage, are described in bulletin. — Indianapolis Wire Bound Box Co., Fernwood, Miss.

For More Details Circle No. 492—Page 153

Fluid Cylinders

Two new bulletins supply information on cylinders for air and hydraulic operation. Bulletin A-101 describes 150-psi line air cylinders while Bulletin H-101 relates

SAVE

WITH Acme MELTING POTS INGOT MOLDS

Designed by FOUNDRYMEN... *for* FOUNDRYMEN

You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States. Write for size list showing 40 standard sizes.

Acme FOUNDRY CO.

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Uni-Wash Shake-Out Booth with 10,000 cfm capacity. Uses a minimum of floor space, draws in dust and hot air blasts, and deposits dust in sludge tank. Built-in fan is only moving part in air-washing process.

Now! More effective dust control

The Uni-Wash Shake-Out Booth is a self-contained dust-collection unit, complete with intake hood, patented Uni-Wash air-cleansing process, and exhaust fan.

Available in five standard sizes—5,000, 7,500, 10,000, 12,500, and 15,000 cfm—they are designed to collect dust from shake-out, core knock-out, shaker-screening, sand-transfer, mold-conveyor, and pouring operations. The dust is collected in the form of wet sludge, and removed by an automatic conveyor. Delivered to you completely preassembled, the Uni-Wash Shake-Out Booth requires only simple connections to water, electricity, and discharge duct.

Call in a DeVilbiss representative today for full details. DeVilbiss Metal Fabricators Company, 17900 Ryan Road, Detroit 12, Mich., subsidiary of the DeVilbiss Co. Branch offices in principal cities.

DE VILBISS

Circle 635 on Page 103

CHILL
KOOLHEAD
NAILS
You can rely on "KOOLHEAD" and "STANHO" products
Chill Nails and Spiders
for...
ACCURATELY CONTROLLED FOUNDRY CHILLING
Write for samples and prices
Choose any style from Jumbo to Stubby; slim, medium or horse nail blade; blunt, pointed, straight or 90° bent. There's a type and size Koolhead Chill Nail or Spider Chill to do your specific chill job best.
STEEL
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PRODUCTS
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and other Stanho products Bulk or Packaged
WRITE for CATALOG and PRICES
STANDARD
Since 1872
HORSE NAIL CORP.
NEW BRIGHTON, PA

Circle 636 on Page 103

to 2000-psi hydraulic cylinders. Construction features, forces developed, styles, dimensions, and weights are given.—**Lindberg Air & Hydraulic Div., Teer, Wickwire & Co.**, Jackson, Mich.

For More Details Circle No. 493—Page 153

Bridge Cranes

Bulletin CR-610 on industrial cranes gives specifications and descriptive data, particularly on new designs and improvements in hoist gears and cases and crane controls. —**Ederer Engineering Co.**, 2931 First Ave. South, Seattle 4, Wash.

For More Details Circle No. 494—Page 153

Electric Vibrators

Booklet gives data and specifications on pulsating magnet electric vibrators to aid flow of bulk materials in containers with capacities of less than 1 cu ft to over 150 tons. —**Syntron Co.**, 540 Lexington Ave., Homer City, Pa.

For More Details Circle No. 495—Page 153

Diecasting Alloys

Brochure covers properties of company's aluminum, magnesium, and zinc diecasting alloys.—**Apex Smelting Co.**, 2537 West Taylor St., Chicago 12, Ill.

For More Details Circle No. 496—Page 153

Electric Hoists

Eight-page section of an electric hoist and car puller catalog describes seven steps to insure selection of the electric wire rope hoist best suited to meet specific requirements.—**Materials Handling Div., American Engineering Co.**, Wheatsheaf Lane & Sepviva St., Philadelphia 37, Pa.

For More Details Circle No. 497—Page 153

Refractories

Booklet entitled "Refractory Brick and Other Shapes for Industry" is intended to aid in the selection of proper refractory products for high-temperature applications. It presents technical data, tables, graphs, conversion charts, and other material. — **Norton Co.**, Worcester 6, Mass.

For More Details Circle No. 498—Page 153

Plastic Metals

Chemical and physical properties and application data are presented in Catalog NI-103, which covers plastic steel, aluminum putty, and plastics.—**Devcon Corp.**, Danvers, Mass.

For More Details Circle No. 499—Page 153

PENTON'S Foundry List

Who? Where?

Metals Melted?

Melting Equipment & Capacity?

Departments Operated?*

Casting Methods?*

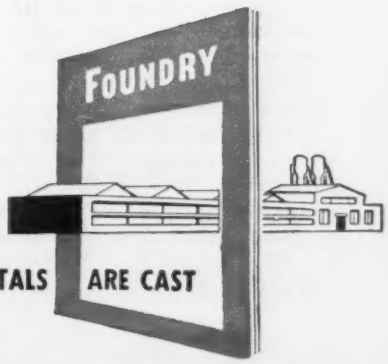
(*) The new, 1958 PFL will include these added features for the first time: a complete list of companies doing die casting and an indication of foundries with heat treating and radiography departments.

• For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in *Penton's Foundry List and Directory.*

The 1958 Edition of PFL is now available. It gives comprehensive information on more than 6,300 metal casting plants in the U. S. and Canada. It tells who they are and where they are located; what metals they melt, their melting equipment capacities, and departments operated.

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. For prompt delivery, write: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

PRICE: $130.00 PER COPY.

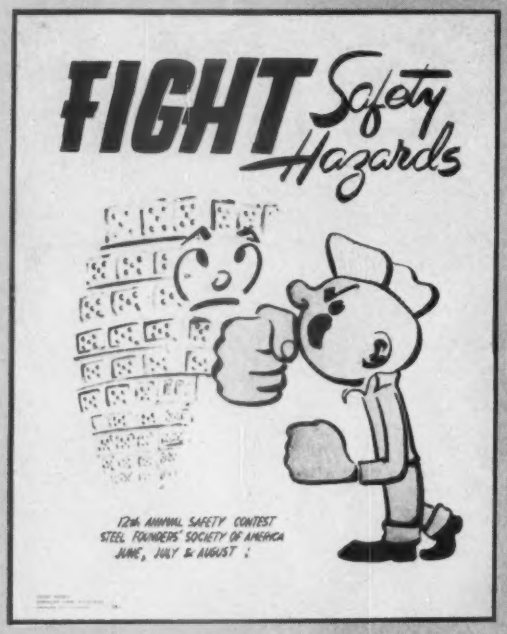


Helping You Sell To Foundrymen

WHEREVER METALS ARE CAST

A PENTON PUBLICATION, PENTON BUILDING, CLEVELAND 13, OHIO

Circle 637 on Page 103



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Steel Founders' Society

POSTERS PUSH SAFETY

THE four safety posters shown here were the winners in the 1958 annual safety poster contest of Steel Founders' Society of America, Cleveland. Held as an adjunct to the society's annual June-July-August safety competition, the poster contest is open to all employees of member companies. Each foundry in the annual contest receives copies of the top four posters, which are reproduced 17½ x 22 in., in color.

The first-place poster is displayed from May 15 to June 1 to announce the safety contest to employees, and Nos. 2, 3, and 4 are displayed successively on June, July, and Aug. 1. Winning posters are selected by the SFSA national Safety Committee from the winners of contests held by the society's eight divisions. Eight additional posters submitted for final judging also are reproduced in color for distribution to society members during the rest of the year. Prizes of $25, $15, and $5 are awarded to divisional first, second, and third-place winners by each division, and the top four nationally also receive inscribed and framed awards.

The winning 1958 posters were submitted by Frank Weber, American Steel Foundries, Granite City, Ill. (Div. VII); Jean Lacombe, Canadian Steel Foundries (1956) Ltd., East Montreal, Que., Canada (Div. I); Willard Bell, Wehr Steel Co., Milwaukee (Div. VI); and R. A. Hershberger, Lebanon Steel Foundry, Lebanon, Pa. (Div. I).

Made by REDA PUMP CO., Bartlesville, Oklahoma

CO_2 AND 20 SECONDS MADE THIS CORE

Can you make an intricate pump diffuser core like this—in 20 seconds? You *can* if you use CO_2.

The CO_2 process insures accuracy and dimensional stability. At the same time, it saves money by reducing labor costs and by eliminating the risks involved in baking and handling.

Write for our free report on other applications of the CO_2 process. Our engineering staff is always ready to work with you.

World's Largest Producer of

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

Chicago 23, Ill.

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

3150 South Kedzie Ave., Chicago 23, Illinois

Please send me a full report on core and mold making with CO_2.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Circle 638 on Page 103

STEP AHEAD

in this 6½ billion dollar market with FOUNDRY's

PLUS 5 SERVICE

What is PLUS 5?

It's a sales program to move your products into foundries. It is as simple as that. Every FOUNDRY advertiser is eligible to test its advantages. Here is help in analyzing this market, studying sales territories and potentials, planning the sales effort, and creating a constructive promotion program to the 6½ billion dollar foundry market. You can't afford to overlook this rapidly growing market—and the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative, and he'll show you real sales aids!

A Penton Publication

FOUNDRY

more than a magazine . . . a complete sales development service

Penton Building, Cleveland 13, Ohio

Circle 639 on Page 103

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macauley Foundry Co.
Berkeley, Calif.

"Retirement"

THERE always have been and probably always will be foundrymen who prefer to die in harness. For them, the foundry is the sole end and aim of existence. It becomes their vocation and avocation neatly wrapped in one package: Retirement would be little short of a living death.

Since a lifetime is surely too brief a span in which to master the intricacies of any branch of the casting industry, perhaps these men who refuse to retire should be congratulated on their decision. They are the type responsible for the George Bernard Shaw epigram, "Happy is the man who loves his work!"

However, the desire to die in harness certainly is not the rule for foundrymen or anyone else. Most men look forward to the time when they will relinquish responsibility to younger and more ambitious men, when they no longer will lie awake wondering how the next day's commitments are to be filled. Then, just as sleep has descended on their weary bodies, the alarm clock jars them back to the reality they were worrying about.

They Can Dream — Most men dream wistfully of retirement, of the day when they can hunt or fish to their heart's content, read books that they've never had time for, travel to far places, dabble with growing plants, or accomplish any of a thousand other dreams that have captivated the human imagination.

Most men enjoy these dreams in contemplation only, for by the time they are financially able to retire, the vision has lost its luster, and both mental and physical vigor have become regrettably weakened. There are beautiful exceptions to this dark picture, however, and the exceptional man achieves retirement gracefully, fully enjoying "the last of life, for which the first was made!"

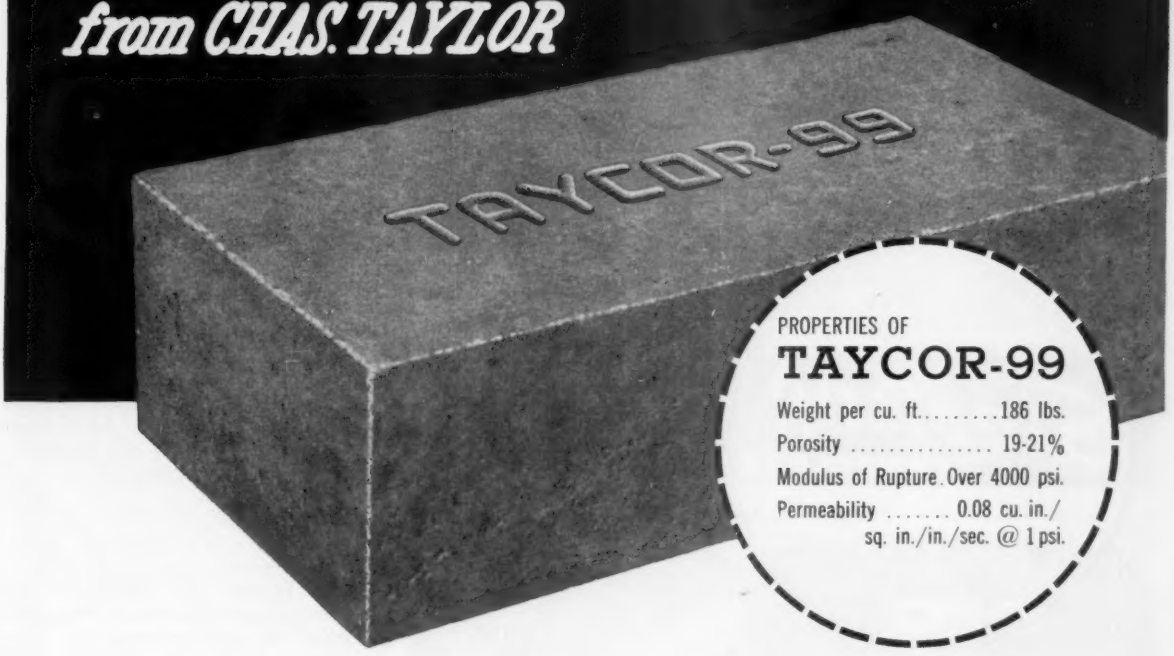
Your old sandman has his personal itinerary for the last few miles of his journey toward the sunset. My plan may or may not materialize, but for the moment it seems pleasant to contemplate.

I hope to select a middle road, whereby I may no longer be connected with any one foundry, but may wander at will from one to another of these casting establishments as a guest of the management —and, I hope, a welcome guest. Of course, I would have to limit my journeying in conformity with what the insurance companies term life expectancy after the age of 65. A conservative estimate might give me five years reasonably free from bodily infirmity. If this should be extended to ten, I would consider myself fortunate indeed.

Inasmuch as I was born in California and have spent the greater part of my life here, it would seem only fitting that I should confine my travels to this state, which is some 800 miles long by 200 wide. My plan would call for the purchase of a station wagon or something of the sort, to be equipped with a selection of basic sand-testing equipment, so mounted or packed as to resist bumpy roads, yet be immediately available whenever required. I also would carry with me 300 or 400 lb of a good grade of silica sand, say about No. 130 AFS, in order to prove the capability of such a sand, where such proof was desired.

In addition to the above, and my personal belongings, I would take

NEW HEAVY-DUTY Aluminum Oxide Refractory from CHAS. TAYLOR



PROPERTIES OF
TAYCOR-99

Weight per cu. ft.	186 lbs.
Porosity	19-21%
Modulus of Rupture	Over 4000 psi.
Permeability	0.08 cu. in./ sq. in./in./sec. @ 1 psi.

TAYCOR-99 is composed of 99% aluminum oxide having extremely high density and low porosity. This new Taylor super-refractory has a P.C.E. of Cone 42 (3659°F.), is volume stable at high temperatures, and exceptionally resistant to attack by basic slags and fluxes. It has outstanding strength and resistance to abrasion and erosion. Available as standard series brick and special shapes.

Use TAYCOR-99 for:

- Metallurgical furnaces operating at higher-than-normal temperatures.
- Hearths and sidewalls of aluminum melting furnaces.
- Hearths and skid-rails of steel heating furnaces.
- Magnesium cells.
- High temperature chemical reactors.
- Piers, arches and other supporting construction in furnaces where heavy loads and severe conditions exist.

Investigate this newest product of Taylor refractory research—and the complete line of Taylor mullite, alumina and zircon refractories—for greater production economies. For detailed information, write direct or call in the Taylor field engineer in your area.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Hamilton and Montreal

TAYLOR ZIRCON · TAYLOR SILLIMANITE

The **CHAS. TAYLOR SONS Co.**
A SUBSIDIARY OF NATIONAL LEAD COMPANY

REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U. S. A.

Circle 640 on Page 103

YOUR BEST *Tip* IN CARTS

No. 119
Sterling
HEAVY-DUTY CART

If you're looking for a good tip for wheeling coal, scrap, chips, turnings or similar heavy materials, see these Sterling Heavy Duty Carts. Over and over again the "3-Point Landing" feature of this well-balanced cart will convince you it's the best buy for years of service. Can be furnished with pneumatics, as shown, or steel wheels . . . plain or roller bearings. Write for Catalog.

3 SIZES AVAILABLE:

No. 119..... 7½ cu. ft.
No. 120..... 9 cu. ft.
No. 121..... 11¼ cu. ft.

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
MILWAUKEE 14, WIS., U.S.A.

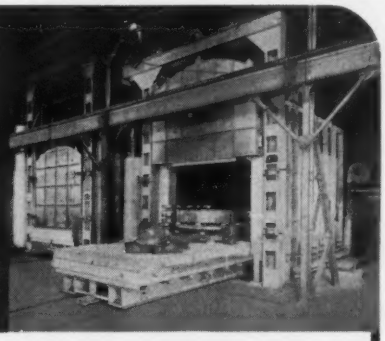
Sterling WHEELBARROWS

Look for this Mark of STERLING Quality

A8076⅓

Circle 684 on Page 103

DFC
CAR BOTTOM FURNACES ARE ENGINEERED FOR BETTER SERVICE



- External Tube-Type Flues:
  - Positive Furnace Pressure
  - Reduced Maintenance Cost
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- Chain & Sprocket or Rack & Pinion Car Mover
- Zoned Heat Chamber Gas, Oil or Dual-Fuel
- Temperature Range 400 to 2,000 F. if Desired
- Temperature Control Designed for All Foundry Heat Treatments: Ductile Iron, Steel Castings, etc.
- Utilizing Engineered Refractory Applications

Ask your Foundry Supplier about DFC Non-Ferrous Melting Furnaces: Crucible, Pot or Reverbratory.

THE DENVER DFC FIRE CLAY COMPANY
3033 BLAKE STREET DENVER, COLO.
DENVER • SALT LAKE CITY • EL PASO

Circle 641 on Page 103

my wife along as secretary and button-sewer-on—and of course there would be her belongings, which might require a trailer. Oh yes, I almost forgot—we'll need a portable typewriter. After all, my principal object in making this extended tour is to get the story, as nearly complete as possible, of foundry sand practice throughout the state.

Starting at the Oregon line, I will be forced to do a lot of zigzagging and even back tracking to visit all foundries and sand deposits between Oregon and Mexico from north to south and Nevada and the Pacific Ocean from east to west. This is quite a chunk of territory, including more than 550 foundries.

The Small Ones Count — Of course, many of them will be small plants, but that fact does not lessen their importance from my viewpoint. I have known small foundries which produced castings of a quality that might well put larger shops to shame. It is quite possible, naturally, that for one reason or another I may not be able to visit them all. In some, I may not be welcome. Others may not be operating during my visit. Or, I may find myself physically and mentally incapable of completing the projected itinerary.

At this point, someone is certain to ask, "This is retirement? What do you expect to gain from all this?" Well, I may gain nothing—just waste my gasoline and rubber, and hasten my appointment with the undertaker. On the other hand, I expect to gain much! I have never visited the greater part of my own state. I probably should be ashamed to admit that I haven't even seen the fabulous Yosemite Valley. So this trip should enable me to speak a little more intelligently of local geography.

I expect to meet some wonderful men, who have, without benefit of fanfare, contributed in some measure to the industry that has fed them. I expect to witness sand practice which is of a most unorthodox nature, but performs its function without apology. From such observation some inkling of knowledge may be gained that will lead to deeper investigation into the mysteries which still confront us.

Perhaps nowhere in industry has the pioneering spirit exerted itself to a greater degree than in the foundry. And surely nowhere has man worked with less and produced more. I expect to meet some of these real pioneers. Where I find myself welcome, and my host inclined to be communicative, I hope

MELTRITE PIG IRON

Always in

Dependable Supply

The entire production is *for sale* at all times.

Strictly merchant, Meltrite is made to the required analysis to meet specifications for many different grades.

More Meltrite is used than any other merchant pig iron.

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Circle 642 on Page 103

to learn something of the history of his community and of the part he has played in its industry.

I will be particularly interested in his *modus operandi* as a foundryman and in the extent to which he has applied mechanization, whether purchased or home-fabricated. His problems (if he cares to discuss them) and his attempted solution to those problems should prove grist for my mill (the typewriter). I would, of course, use no names or stories without permission, but where permission was granted, I'm sure that the stories would carry some value or interest for both of my readers. At any rate, there are many questions that I intend to ask, and the answers might hold some element of surprise.

In return for the courtesies extended to me, I might, from my limited experience, have the answer to some of my host's unsolved problems. It would prove gratifying indeed to my aging ego if I might occasionally help him over a rough spot.

The Matter of Knowhow—I have come to the definite conclusion that in the general advancement of (small) foundry progress, our acquisition of knowhow is not so much a matter of praying for help from our adademic heavens as it is in being a little more honest with each other in an attempt to exchange and assimiliate information on the foundry floor.

I feel that knowhow is a foundry development born of basic need, but that "know-why" is derived from a higher level of thinking.

Apprentice Training Booklet Is Published by AFS

Apprentice programs are the subject of a booklet, "Apprentice Training—How To Do It," published by American Foundrymen's Society, Golf and Wolf Roads, Des Plaines, Ill. A sample apprentice training program included in the booklet gives a suggested work schedule, describes a foundry apprentice workshop, and outlines apprentice classwork and related study. It also describes joint apprentice training activities of an AFS chapter in cooperation with a state department of vocational education with a related training cost, for a four-year period, that amounted to approximately $64 per man. A list of foundry companies working co-operatively in the industrywide effort of apprentice training is included.

MILWAUKEE COKE SOLVAY

For Over Half a Century the

Highest Quality Foundry Coke

Consistently high in carbon and low in sulphur and ash . . . highly resistant to shatter and abrasion, Milwaukee Solvay has hundreds of satisfied users. It has remained the foundryman's choice for *over 50 years.*

If you are not already a user, may we ship you a *trial* car?

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Circle 643 on Page 103

Maintenance man replaces the blades in new-type wheel installed on older blast cleaning machine

The alloy wear plates in a swing table unit are being checked by this maintenance man

Cutting Cleaning Costs through

PREVENTIVE MAINTENANCE

By **THOMAS F. HAMELINE**
Supervisor, Parts Service
Wheelabrator Corp.
Mishawaka, Ind.

INDUSTRY's problem today is to cut and recut production costs which already have been cut to rock bottom.

New equipment is only part of the answer, for many foundries faced with this problem are using equipment only a few months or a few years old. The answer seems to lie in a broader approach, involving not only the selection of the right equipment, but also the operation of this equipment at maximum efficiency with a minimum of downtime.

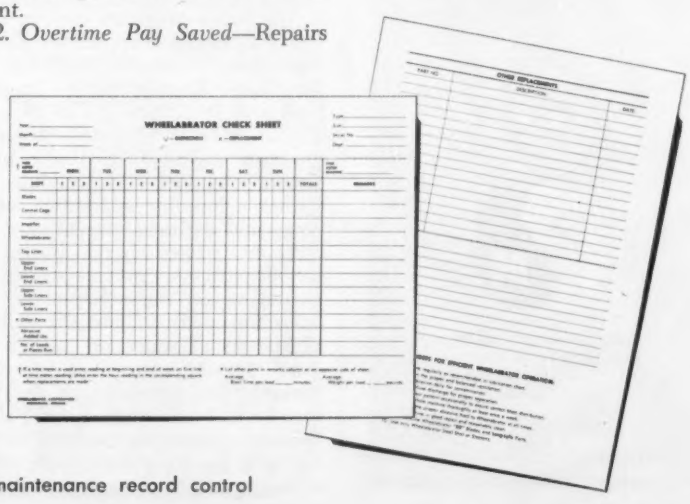
This approach involves scheduling maintenance so that repairs can be made during off hours, without interfering with the flow of work. It also involves taking another look at all equipment to see where it might be modernized or improved by reconditioning without replacing equipment before it has served its useful purpose. The name commonly applied to this sort of program is preventive maintenance.

Benefits of Preventive Maintenance—Let's examine some of the benefits of a preventive maintenance program to see how it can help to increase plant efficiency and lower over-all manufacturing costs.

1. *Costly Downtime Reduced* — Most repairs are handled during off hours when they do not interfere with the productive time of the plant.

2. *Overtime Pay Saved*—Repairs are made during scheduled working hours, instead of on an emergency basis. Maintenance work does not pile up, and overtime is reduced.

3. *Spare Parts Inventory Minimized*—Parts inventory is reduced through better control and scheduling of parts needed and less fre-



Suggested check sheet for preventive maintenance record control

ACHESON

dispersions digest

Reporting uses for

dag® BRAND DISPERSIONS

COLLOIDAL GRAPHITE, MOLY-SULFIDE, VERMICULITE, AND OTHER SOLIDS

'DAG' DISPERSIONS – THE ANSWER TO LOWER COSTS, BETTER CASTINGS

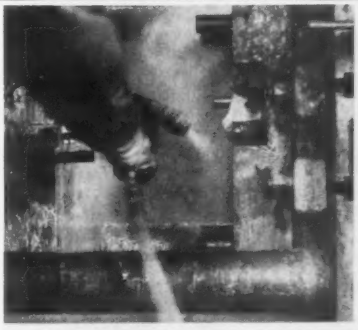
Acheson dispersions have proved themselves to be particularly effective as die and mold cavity coatings. They contain heat-resistant solid particles so finely divided that they remain in suspension for extended periods, making continuous agitation unnecessary. This fineness is an important characteristic because the films formed with these dispersions are so thin that they do not affect casting dimensions. As described in the following application case histories, both colloidal and semi-colloidal dispersions provide excellent parting, high-quality surface finishes, and longer die life. The consistent uniformity of 'dag' dispersions is your assurance of uniform castings.

A 'dag' 193 wash sprayed on mold cavities at Rapidscast Corporation gives them aluminum permanent mold castings of more uniformly high quality.

"We're sold on 'dag' 193 because it's consistent", states Robert Cope, president of Rapidscast Corporation, Grand Rapids, Michigan. After trying 22 mold wash combinations with as many different characteristics, Mr. Cope settled on 'dag' 193 — an Acheson vermiculite dispersion with a water carrier. Why? . . . Because of its completely uniform consistency, 'dag' 193 can be easily mixed to the three dilution ratios Rapidscast uses to obtain the required variance in film thickness throughout their molds. The unbroken film provided by this dispersion acts as a heat-holding blanket which helps to prevent "shrinks" or vacuum holes caused by uneven cooling of the molten metal. Also important to Rapidscast is the durability of a 'dag' 193 film coating. One application generally lasts through an entire molding day of three shifts, except for occasional touch up at wear points. And this uninterrupted production is a "must" since Rapidscast supplies such demanding customers as the automotive, aircraft, hydraulic, marine and appliance industries.

You'll find that Acheson processing methods produce dispersions of finer quality and more versatile use. Call your Acheson Service Engineer today for more specific information on the use of 'dag' dispersions. Or write direct for additional facts on " 'dag' colloidal dispersions for use in metal casting," Bulletin No. 425. Address Dept. F-88.

'Aquadag' finds ready acceptance by diecasters for its high temperature resistance, clean parting, and a smoother-surfaced casting.



Bendix finds 'Aquadag' a substantial cost saver. Rejects are down 30% at Bendix Foundries, Teterboro, New Jersey. Where surface folds, internal gas-induced porosity, and other not uncommon factors had previously caused a costly number of rejects in certain critical die-castings, Bendix now enjoys production advantages by using the Acheson water-based dispersion, 'Aquadag'. Used in casting magnesium jet-engine turbine blades and aluminum instrument components, the tough, dry lubricating film provides cleaner parting from the die. This film facilitates proper metal flow. It prevents the molten metal at 1250° F. from soldering to the steel die. It effectively resists the scrubbing action accompanying metal injection, where pressures are often as high as 30,000 psi. Proof of the inherent strength of this film is shown by the fact that one sprayed application normally lasts ten or more casting cycles. Die life is also appreciably extended. 'dag' Colloidal Graphite can play an important part in *your* casting operations . . . a lubricant that is non-volatile, chemically inert, and finely dispersed to provide complete coverage of the die surface.

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quent replacement as the result.

4. *Maintenance Labor Made More Productive*—With maintenance and repairs conducted on a planned schedule, there is less overworking of maintenance manpower and facilities.

5. *Maintenance and Repair Programs Cost Less*—Repairs made before they become emergencies cost less to make. Fewer parts are needed when repairs are made on a planned basis. Multiple handling and removal of parts is avoided because all repairs are made at one time. Temporary repairs which must be redone are eliminated.

6. *New Equipment Expenditures Delayed or Eliminated*—Preventive maintenance keeps existing equipment operating efficiently much longer and adds to the serviceable life of a machine.

7. *Employee Relations Improved*—Planned maintenance reduces involuntary layoff of production workers because of operational failure.

8. *Product Rejects Reduced*—Efficient operation of equipment reduces rejects and spoilage.

9. *Unit Cost of Manufacture Cut*—By saving productive time, reducing maintenance time, and increasing the efficiency of equipment, preventive maintenance reduces the unit cost of manufacture and adds to profits.

These are the major advantages common to such programs. Actually, the nature and the goals of a preventive maintenance program vary in some degree from plant to plant.

Inspection Is Basic—Inspection is the key to preventive maintenance. Even with equipment as self-destructive as airless abrasive blast cleaning machines, inspection and preventive maintenance can minimize the effects of wear. Although preventive maintenance measures vary from foundry to foundry, certain items are basic to such programs. These include daily inspection of known critical wear parts, weekly inspection of the entire machine, and inspections at longer intervals that amount to virtual overhaul.

Daily Inspection—Daily contact with blast cleaning machines is extremely important because minor repairs and replacements can be made before major problems develop. In some foundries, daily inspection is the responsibility of equipment operators. In others, particularly where several machines are used, a millwright may "float" among machines, examining them at opportune times, such as between loads, during lunch hours, or whenever else the machines are not in use. In still others, the maintenance supervisor or master mechanic has a periodic inspection program to which one of his men is assigned.

Most inspection programs call for a work sheet which lists various checkpoints and has blanks for permanent maintenance data. By checking the inspection sheet, the maintenance supervisor can determine when replacement of parts or major overhaul of a machine is needed. The check sheet also can be used for inventory control of spare parts. Because of the variety of types of blast cleaning machines, and because of individual differences among foundries, it is impossible to offer a comprehensive check sheet that will fill the need of every application, but one similar to that pictured with this article usually is adequate.

Weekly Inspection—In addition to the daily inspection, a more comprehensive weekly inspection is a good idea. This inspection can include the following details:

1. Check all liners in the wheel assembly, including the auxiliary deflector, the circular deflector, the deflector plates, and the lower end liner for wear. These must be kept in A-1 shape, not only to get the full effect of the blast from the wheel, but also to keep the wheel itself and the cabinet from wearing out. When the auxiliary deflector and the circular deflector are worn through, abrasive can get into the sides of the wheel and cause wear.

2. Change control cage and impeller, if necessary.

3. Replace blades, if necessary. Uneven blade wear throws a wheel out of balance. When this problem occurs, install a complete new set. Worn-through blades damage the wheel unit.

4. Balance the wheel, if necessary. This step may require changing the wheel components or the wheel itself. (It often is possible to save considerable time by keeping complete wheel assemblies in stock so that when it becomes necessary to change parts, other than blades, a whole unit can be changed at one time. Usable parts can then be salvaged from the old unit at the convenience of the maintenance crew.)

5. Check the dust collector fans for balance and to determine whether the fan is rotating at proper speed and in the right direction.

6. Check the abrasive screens. A hole in the screen permits chill nails or heavy slug scale to plug up

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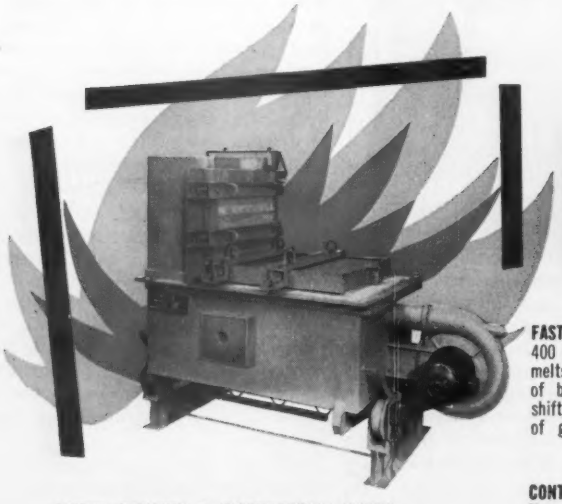

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the system. If such material is allowed to circulate and reach the wheel, the blades will break.

7. Check the refuse spout for usable abrasive.

8. Check wear on abrasive conveyors.

9. Check gear drives and all other drives.

10. Check elevator belts, pulleys, and buckets.

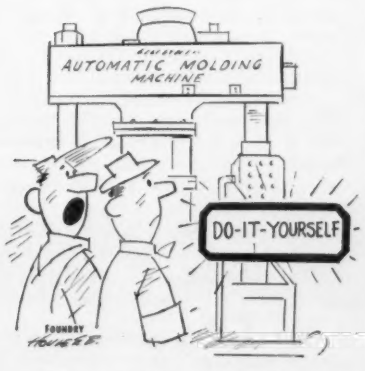
11. Inspect all bearings and lubrication points.

The same chart recommended for daily inspections also can be utilized for weekly inspections.

Equipment Improvements — The need and feasibility of installing new developments in older machines is determined by regular inspection and scheduling of maintenance. Every year, engineering developments create new and improved parts for blast machines. Often it is possible to install these parts on older machines with little extra effort. An older machine which has been well cared for can be updated to a nearly new condition in the course of routine maintenance by the addition of such parts as clock-dial control cages, unit-type bearings, sectional-type guard housings, latest-type wheels, and wear-resistant wear parts. All these steps are worth while.

Other areas of the machine also can be replaced to get additional years of service from the entire machine. For instance, new baffle plates can be added to an old separator, or a complete, new separator can be installed if it is needed. In either instance, separation will be more efficient, and the amount of wear on equipment parts will be reduced.

Auxiliary electrical controls such as ammeters, blast-cycle timers, and wheel hour meters also should be in-



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cluded in the routine inspections. If machines are not equipped with these accessories, they should be installed. Only through the use of these control items can accurate records of machine operation be obtained.

Specific Examples — Of course, preventive maintenance depends on trained men and accurate records. The following illustrations show what is being done in preventive maintenance at two rather typical foundries.

At a large steel foundry in the Cincinnati area, for example, the maintenance superintendent insists on thorough daily inspection of the blast machines. In the nine years that the firm has been operating its special cabinet, it has not had to replace any of the three original blasting wheels.

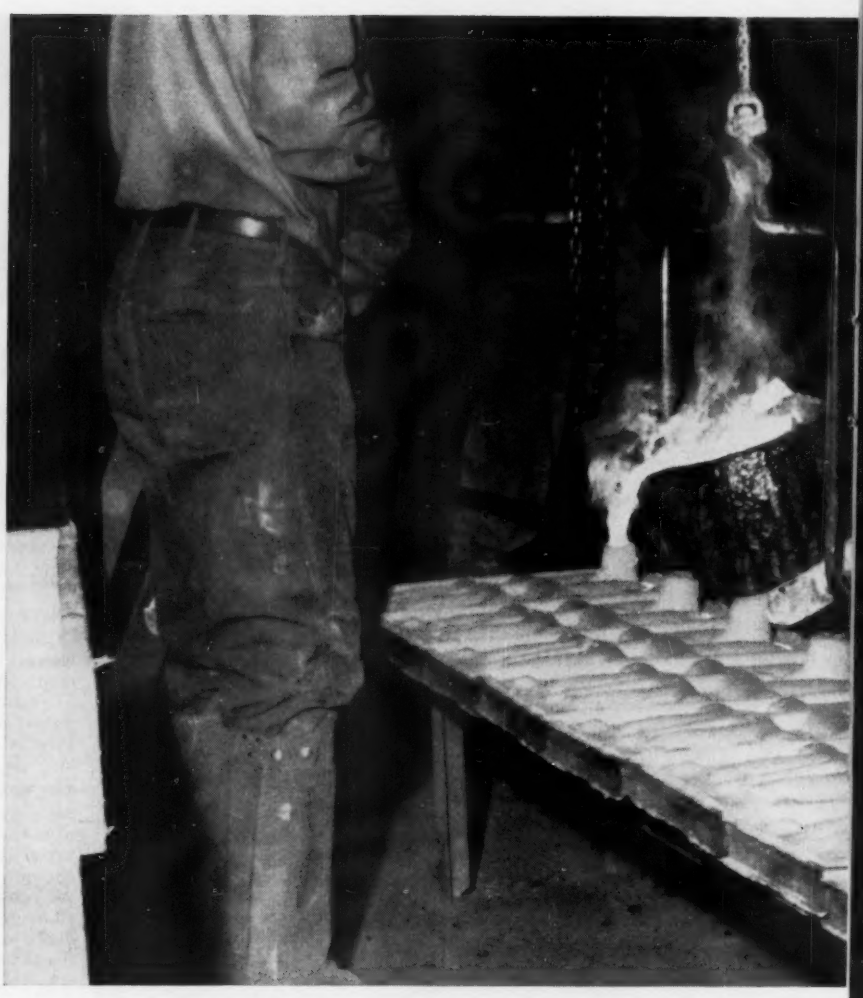
This record is an outstanding tribute to the fact that the company controls wear on the wheels by replacing control cages, blades, and impellers before the wheel components are worn out of balance.

This foundry keeps records on blast machine performance that provide a great deal of valuable information. Company officials maintain, however, that the best records are worthless if the information they contain is not utilized fully.

Prior to installing alloy wear parts at the suggestion of the serviceman, the maintenance department spent at least eight hours a week replacing mild steel liners on blast equipment. After 21 months, no alloy wear parts have had to be replaced. This firm also recently installed wheel-hour meters on its machines to help it keep more accurate records on parts life and abrasive consumption.

Another Example—A gray iron foundry in the Milwaukee area, with a production of approximately 36 tons a day, operates three blast cleaning machines. It is important to this foundry that these machines remain in a good state of repair if they are to maintain their heavy production schedule. The maintenance superintendent has set up a sound preventive maintenance program to insure peak performance from the three machines.

Here is how the maintenance superintendent explains his program and operation: "Our cleaning units are comprised of a great number of parts. One part failure often is enough to render a machine inoperative. The aim of our program is to anticipate part failure before it occurs and to schedule repairs before production time is lost."



What can happen in just three years when a foundry tries shell molding

How soon does shell molding begin to pay off?

The answer depends, of course, on many factors; but this report from Standard Brass Foundry Co., Cleveland, may help you set up some guideposts.

This 57-year-old firm started shell molding in a pilot plant in 1954. Today, after only three years' experience with shell, Standard Brass is successfully pouring a wide range of metals, including red brass and pure copper, in Durez-bonded shell molds.

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Using Durez foundry resins exclusively, Standard produces dense, nonporous castings that eliminate 75% of the scrap formerly experienced with green sand castings.

The absence of blow holes and internal voids in these castings means much more productive machining time for Standard's customers, and results in lower cost per finished piece.

Closer tolerances, clear, crisp threaded sections, cast-in slots, and other details impractical with sand castings are now routine procedures in this foundry's new, fast-growing shell department.

Standard finds a strong sales advantage in the *smooth surface* of castings poured in Durez-bonded shells. Most pieces require little or no cleanup before shipping.

"Put a shell casting up against a sand casting," says Standard Brass President Marvin Wolf, "and the appearance alone sells shell."

Sound, dense castings that need little or no cleanup are poured at Standard Brass Foundry Co. in these Durez-bonded shell molds.

As you can see, it doesn't take too much time to begin reaping the benefits of shell molding. More and more foundries are doing it every month.

How to get started

Your Durez technical man can help *you* plan and carry out a conversion program. He's foundry-trained; backed by 35 years of resin experience and research. Call him in soon.

In the meantime, stay on top of newest shell molding developments by reading fact-filled "Durez Shell Molding News," published bimonthly. Write for it now—and let us know who else in your company should be receiving it.

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Circle 647 on Page 103

In this foundry, one maintenance man reports for his day's work at 6 a.m., an hour before the cleaning room begins operations. His first job is a thorough inspection of the blast machines. This daily inspection includes an examination of all wheels, including blades, impellers, control cages, and wheel housing liners on each machine. He checks these parts for wear and estimates the number of hours of service left on any part that shows considerable wear. Parts that soon will need replacing are scheduled so that replacement will not interrupt cleaning production.

He then checks the elevator pulleys and belts for proper alignment on each machine. He examines the complete separator and gives special attention to checking the abrasive screens. Discharge from the refuse spouts is inspected each day to insure that no usable abrasive is being drawn out by the separator.

The weekly inspection schedule is more thorough and includes lubrication of all bearings and examination of the main mill drive.

Each quarter, the screw conveyors are pulled and examined closely for wear and alignment. All abrasive buckets in the elevator are examined for undue wear and are replaced if necessary. In addition, operators of the machines are cautioned to be continuously alert for any suspected trouble and to report it immediately to the maintenance department.

Needless to say, much that can be done in the way of preventive maintenance is not covered here. A preventive maintenance program will serve, however, not only to extend the life and efficiency of blast cleaning equipment, but also to establish realistic standards of operating efficiency to make airless blast cleaning an increasingly profitable operation.

British Investment Casters Form Technical Association

The British Investment Casters' Technical Association was formed June 11 with headquarters at 5 East Bank Rd., Sheffield 2, England. The organization meeting was held in London.

John Bolton, secretary, in a letter to Robert R. Miller, Precision Metalsmiths Inc., Cleveland, and president of the Investment Casting Institute of this country, expressed the desire that the two groups will enjoy a high degree of technical co-operation.

Trouble Shooting

By C. W. AMMEN

The Molder's Touch

Dear Charlie:

All problems in the operation of a foundry do not involve gating, melting, etc. Nevertheless, they are problems.

We have tried several systems of training apprentices and several types of high-geared aptitude tests to determine who should and who should not make a skilled mechanic. Some of these tests are designed to determine for which niche in our organization a man is best suited. What aspect of a person is more likely to determine his mechanical aptitude? We have found that some of the lowest IQs and men with the lowest marks in an aptitude test wind up as highly skilled mechanics.

Sincerely,
Sam

Dear Sam:

This type of query is a bit away from the physical problem. I agree with you, however, that it is a problem. Foundries throughout the world have spent a lot of money in an attempt to determine a man's abilities prior to spending much money and time on his training, only to find out that he does not have the makings of a skilled mechanic. Some shops are faced with a 30, 60, or 90-day time limit by union contract to determine whether a man is acceptable.

Once I did a hitch as superintendent in a plumbing ware foundry with a 30-day limit. If I did not unload a new hire within the 30-day limit, he not only became a mechanic, but he had to commit murder or treason for me to have sufficient grounds to dump him. Thus we had a big labor turnover because of our efforts to screen those who had it from those who did not have it.

We tried several types of gadgets to determine prior to hiring whether a man did have it or not. No luck! One firm even enlisted the services of a psychiatrist to give everyone a trip on the couch. After a month or so of this procedure, it was decided that the psychiatrist was nuts.

You will find that tons of information have been written on countless surefire methods of training and of establishing a person's degree of manual dexterity. Each more or less condemns all other methods, much like toothpaste and tobacco advertising. The fact that a man holds a journeyman's card or the length of time he has had it does not seem to have any bearing on whether or not he is a skilled mechanic. Practice does not always make perfect—not by a long shot. We all know mechanics who have spent years at the trade and at their best still are not skilled. Also, there are many people who in a relatively short time become well skilled.

Where does this situation leave us? Well, we can deduce that it's possible to know all the scientific facts and mechanical operations and practices involved in a job and still have no feeling for it. On the other side, one can have an intuitive understanding of mechanical aspects of foundry practice without knowing the physical and chemical processes involved. This man has a feel for it. One must not become so interested in the factual knowledge involved in foundry practice as to lose sight of the real purpose of the techniques and practices. This point is a stumbling block for many a young foundry engineer as well as for apprentices.

The facts help us to understand the nature of the materials and principles involved in foundry practice and are of particular advantage in controlling materials and processes through various techniques. It is not necessary, however, to know these facts to be mechanically skilled. One of the most skilled men I have ever seen knew when something was right or wrong and what to do to correct the difficulty, but he did not know why. I do not say that all screening procedures are ineffective, nor do I say that training programs are ineffective. Some are excellent. I have gone over many very closely, however, and a good many stress technical content.

Technical foundry knowledge is of no value whatsoever to a student

unless it is clear enough not to interfere with his creative visualization. It is far better to train by other means for which one has a feeling. Knowing a technique is of no value unless it is assimilated into the creative thinking process. A mechanic's visual conception is limited by his ability to handle the materials with which he works.

Thus we arrive at the theory that to train properly, we must do so in such a manner that the training is absorbed into the trainee's creative thinking process. This point is, I believe, more or less accepted. The method used to accomplish this goal is a big point of controversy.

This being so, we say that this visual conception is limited only by the ability to handle the materials with which he works. In other words, one is lost without the other. One could have the visual conception necessary to paint a beautiful sunset, but be unable to do so (even though he sees it plainly in his mind) because he lacks the ability to handle the brushes and paints. He does not, in other words, have the touch.

Now, consider the problem from the other side. We study, test, and train a person's visual conception by various methods until we are satified he has it. But what about the touch or ability to handle tools and materials which limits his ability to use his visual conception? Will practice and training improve this touch or ability? Yes, it will, but only to a degree. The extent of a person's ability to handle tools and materials is related directly to the physical structure of his hands. By this physical structure I do not mean shape, size, or outward appearance of his hands. In addition,

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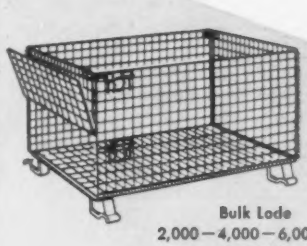
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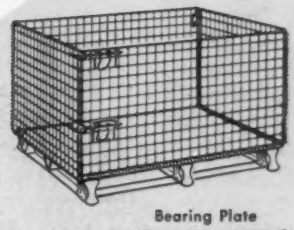
Capacities


Bearing Plate
2,000—4,000—6,000 lbs.
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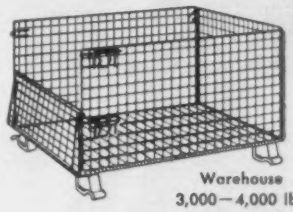
Warehouse
3,000—4,000 lbs.
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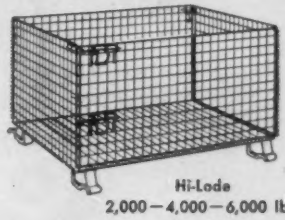
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the degree of touch necessary to perform various types of activities varies.

Have you ever handed a delicate object to someone only to have it crushed when the receiver applied too much pressure because he did not feel it until too late? It is the pressure on the skin of the skilled mechanic's hand that gives his brain the information known as the "decision to act." It is divided into light and deep touch.

Light-pressure receptors are located in the skin's fibrous inner layer or derma, and the heavy pressure receptors are directly below them. The light receptors are very sensitive, but more pressure is needed to activate the heavy receptors. Some persons have poor reception on both light and heavy receptors.

All hand or skilled work is performed to a large extent by pressure or the release of pressure, including cutting a gate, sleeking, patching, and drawing a pattern. The correct amount of pressure or release of pressure is determined by one's ability to feel. Physical training and practice will develop all our senses, but only to the extent of the limits of these senses. If one's ears are so constructed that they will not receive sensations above a given range, all the training in the world will not increase the range. Thus it seems to be with our hands.

Aside from our senses of sight, hearing, touch, smell, and taste, we possess one known as kinesthesis. This sense is the one which enables us to know the position and location of our members, including our fingers, with our eyes closed. It is classified as the guiding force. As a patternmaker puts his chisel to the wood, kinesthesis guides the chisel to the correct position. Touch tells the patternmaker whether he is applying the correct pressure to the chisel to make it perform as he wishes. Kinesthesis is important in the control of habits of work once the correct habit has been formed.

Kinesthesis measures the all-important amount of pressure or release of pressure. A blind person with a high sense of kinesthesis and touch can perform many skills difficult for the sighted.

It seems you just have to have the old touch. Some do and some don't. Develop methods to test one's ability to feel, coupled with a good test for kinesthesis, then train with emphasis on the real purpose of techniques and practices.

Sincerely,
Charlie

EASTERN APPRENTICESHIP CONFERENCE

Discusses Foundry Training Needs

TWO sectional meetings were devoted to foundry subjects at the 14th annual Eastern Seaboard Apprenticeship Conference at Groton, Conn., June 23-26.

John S. McCauley, director of research, Bureau of Apprenticeship & Training, U. S. Department of Labor, Washington, reviewed the findings of the foundry industry surveys in mechanized and jobbing shops, and presented the indicated training needs for future years. Emphasis was placed on the need for four-year training periods for patternmakers, maintenance mechanics, and electricians and the growing trend for obtaining trained technicians and production machine operators in molding and coremaking.

A review of the responsibilities to meet the training demands for foundry skills was given by F. G. Sefing, Development and Research Div., International Nickel Co. He pointed out that with about 350,000 foundry employees in 1957, the number might be expected to grow to about 400,000 by 1975. With an annual replacement need of about 10 per cent of the total employment, approximately 35,000 to 40,000 employees would have to be trained annually for various skills.

The AFS Training and Research Institute, designed to train and aid the technicians and supervisors of foundries, might aid in the training of about 2000 to 2500 foundry employees annually, but the training of machine operators and skilled molders, coremakers, patternmakers and maintenance mechanics is the responsibility of foundry management.

George Campbell, assistant director, Skilled Trades Department, United Automobile Workers, pointed out that with the advent of mass production, foundry operations shifted from job molding and coremaking to highly repetitious production work. He said that with the demand for high-quality castings, there is a resurgence in the need for highly trained molders, coremakers and patternmakers. In training foundry workers, a marked distinction must be made between training for skilled journeyman, molders, coremakers, and patternmakers and training for machine operators.

At a roundtable discussion, A. P. Fisher, superintendent of industrial relations, Taylor-Wharton Co., High Bridge, N. J., spoke on manpower developments. He pointed out the change from employing all comers to making a selection based on the use of tests such as Bennett's test on mechanical comprehension. Tests showed the lowest 25 per cent were not suited for foundry work and the best 25 per cent did not remain with the job because of a desire to advance themselves. The best workers were found in the middle 50 per cent. These men responded to a good training program and seemed to be best suited to foundry work.

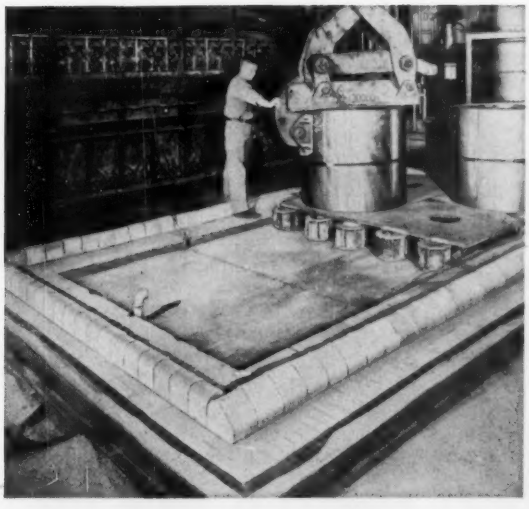
Woodrow Wilson, Bullard-Havens Technical School, Bridgeport, Conn., described an effective program of training for different skill levels. The school believes in nearly a 50-50 division of shop and related subjects. The related subjects are given to molders, coremakers, patternmakers, machine operators, mechanics, and electricians at one time, since the sciences are basic to all. Such a program permits excellent instruction covering a fairly large number of trainees at the minimum cost. The best workers and trainees are selected from the most promising employees on machines. In this program, technicians are developed from the best mechanics.

John Keenan, vice president, International Molders and Foundry Workers Union, Cincinnati, pointed out that the best men are in the best foundries which generally have the best equipment and have the best reputation for quality products. These foundries are the least affected by periods of business recession. Training of employees is a long-range program. It should be organized for the long pull of the particular foundry and not be affected by periods of recession or high productivity. Statistics show that many foundries do not take advantage of the 1-8 rule of apprentice training.

Vincent Staats, assistant superintendent, cars and shops, New York City Transit Authority, showed animated films on training workers to do a better job and for replacements. His film on "Pride Goes to Work" emphasized how increased productivity, decreased costs and waste, and methods of evaluating a job bring improved benefits to the worker and to the company.

Four-stack strip annealing furnace with a capacity of three 30,000 lb coils on a 34 to 36 hr firing cycle, 68 to 78 hr cooling, operating at a strip temperature of 1320 F in a 8.2% CO atmosphere. The base, 9" thick hearth and portions of the curb are cast of B&W Kaocrete-A.

B&W Kaocrete-A resists CO disintegration and sand penetration at Granite City Steel



B&W Kaocrete-A is cast in the hearths and curbs of these furnaces where firebrick refractory was previously used.

Granite City Steel states that both bases have been in use for over three years without any disintegration resulting from the CO atmosphere. In addition, the monolithic structure of this B&W castable refractory eliminates the destructive effects produced by sand penetrating the joints and cracks of firebrick hearths.

For further information on B&W's specialized refractory castables, write for Bulletin R-35.

Strip annealing furnace with a capacity of 70 to 80 tons per charge on a 24 to 48 hr firing cycle, 48 to 96 hr cooling cycle, operating at a strip temperature of 1320 F in a 8.2% CO atmosphere. 4½" lining of B&W Kaocrete-A is used on hearth and curbs.

B&W REFRACTORIES PRODUCTS: B&W Allmul Firebrick
B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick
B&W Refractory Castables, Plastics and Mortars
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R-585

Obituary

JAY T. OSLER, 73, chairman of the board of Continental Foundry & Machine Co., East Chicago, Ind., until his retirement in 1955, died July 4 in Fort Lauderdale, Fla. Mr. Osler retired when Continental Foundry was acquired by Blaw-Knox Co., Pittsburgh, continuing as a consultant. He had previously been associated with Lewis Foundry & Machine Co., Standard Engineering Co., Elwood City, Pa., and Hubbard Steel Foundry.

Dr. Samuel W. Martin, 47, vice president, Great Lakes Carbon Corp., New York, died July 10 in Chicago. Dr. Martin joined the company in 1949 as associate director of research and later became general manager of the research and development department.

William J. Healy, 60, sales manager for the blower and compressor, and turbine divisions, De Laval Steam Turbine Co., Trenton, N. J., died there June 3. He represented the company for 10 years as a sales engineer with Turbine Equipment Co., and joined the De Laval plant sales staff in 1938.

Herbert Flint, 69, former vice president, State Foundry Co., Akron, Ohio, died May 29 in Orville, Ohio. Born in England, Mr. Flint came to the United States in 1909. At one time he was superintendent, Quality Castings Co., Orville, Ohio, and a partner in Berted Foundry, Columbiana, Ohio.

L. M. Nesselbush, president and general manager of Falcon Foundry Co., Lowellville, Ohio, died July 12. A member of the original board of directors of the Non-Ferrous Founders' Society, Mr. Nesselbush served as its vice president in 1946-47.

John W. Cleveland, 59, secretary-treasurer, Whirl-Air-Flow Corp., until 1957, when the company moved from Chicago to Minneapolis, died June 20 in Evanston, Ill.

Jesse R. Bodine, 73, president, Bodine Pattern & Foundry Co., St. Louis, died June 20, as the result of an automobile accident. Mr. Bodine had been president of the company 46 years.

Edward J. Moser, 61, formerly associated with Cordova Machine & Foundry Co., Cordova, Tenn., died June 15.

Harry E. Muchnic, chairman of the board, Locomotive Finished Materials Co., Atchison, Kans., died June 26.

Edward Wheeler, metallurgist, Belle City Malleable Iron Co., Racine, Wis., died May 27. Mr. Wheeler joined the company in 1928, and later attended University of Wisconsin. He worked in the payroll department and as analyst prior to the time he became chief metallurgist.

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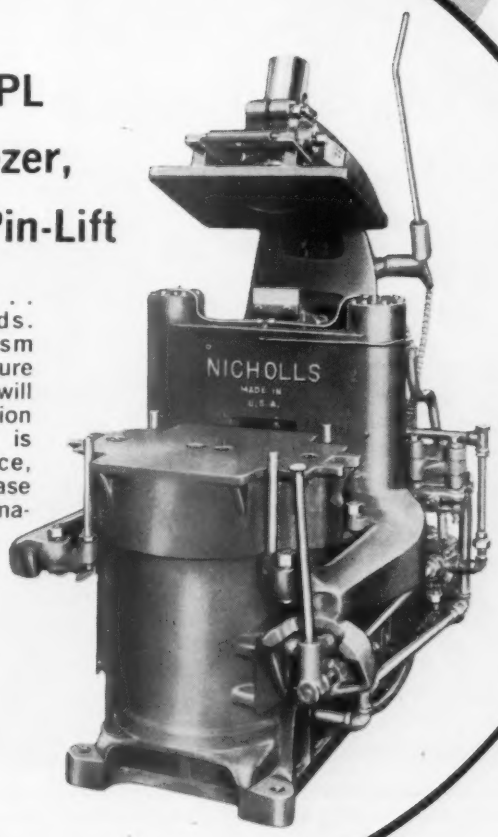

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Circle 651 on Page 103

Around the Country

NEWS REPORTS FROM

Chicago . . . Pittsburgh . . . Boston . . . Philadelphia

Pittsburgh— Foundries supplying castings and rolls to steel mills benefited indirectly from the hedge buying of steel products that occurred in June. Higher steelmaking operations resulted in a greater demand for castings used in maintenance. Roll inventories were reduced enough to warrant buying for replacement, but orders remained far below last year's level.

Most foundries shut down in July for two-week vacations. Others continued to operate at 50 to 60 per cent of capacity. One nonferrous foundry kept older employees working four days a week, but limited new men to three days.

Backlogs of steel and gray iron foundries are almost nonexistent. Railroad buying is at the lowest level in years. Manufacturers of construction equipment have too much unsold machinery in their yards to be seriously concerned about building more.

Foundrymen see little hope of improvement before September. In the meantime, they'll have to worry about shrinking profits as well as low volume. Wages went up on July 1 in foundries organized by the USW. Competition is so sharp at current prices that the increased labor costs can't be passed along to customers.

Boston—Some indications point to mild improvement in demand for gray iron castings in the fourth quarter, but foundries have resumed operations after vacation suspensions at about the average second quarter rate—50 per cent of capacity; this figure will hold for August.

Machine tool volume is flat. A mild pickup in bookings earlier this year has not been maintained, and foundry operations have not benefited.

Users of castings have low inventories and even a mild increase in bookings by metalworking industries would soon be reflected in foundry melt. Without backlogs, shops are highly competitive for what volume prevails. Prices are not satisfactory, but most gray iron shops are taking no risk as to quality.

Pig iron is unchanged for third quarter — $68, Everett, Mass., furnace, for No. 2 foundry—and cast scrap is considerably below that level. Natural assumption would be for a higher ratio of scrap in the

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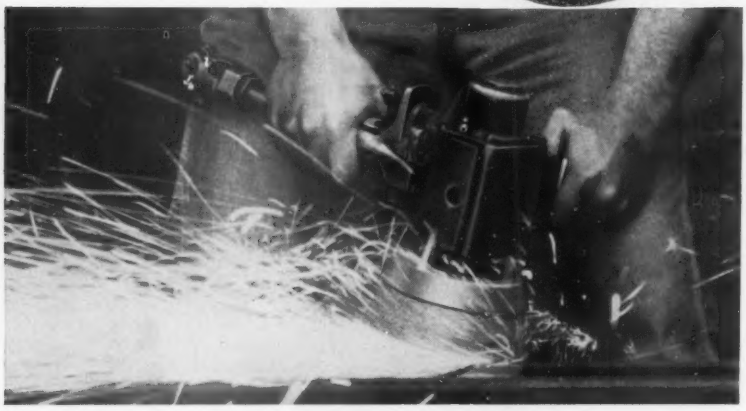
the roughest
jobs . . .



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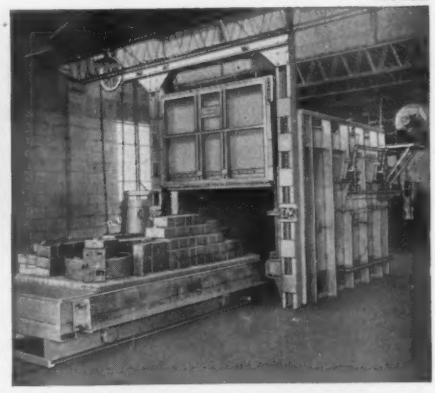

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Circle 655 on Page 103

melt, but most shops are holding closely to their former mixes in the charge to assure quality. Rejects are doubly costly under current conditions, and customers are exacting as to specifications. Mystic furnace will be banked through most of August, and shipments are coming from a large inventory accumulated at Everett.

Shipments of ferrous castings by New England foundries so far this year are well below those of a year ago. Gray iron is down an estimated 25 per cent, malleable 28 per cent, and steel more than 30 per cent. These declines are somewhat less than the national average drop due to the fact that volume in New England began to slide off earlier in 1957. Until midsummer, both malleable and steel shop operations were relatively better than gray iron, but backlogs now are depleted.

Nonferrous operations also are down, although through the first half they held somewhat above the ferrous rate. Shipyard support is maintained, but some tanker contracts have been deferred or cancelled. Activity in heavy electrical equipment is slightly above normal, although here too there has been some recession. Valve and fitting industry sales are about 15 per cent under last year, but earnings are down even more adversely because of severe price cutting.

Philadelphia— A slight betterment in foundry operations is expected in August. Suspensions for mass vacations likely will be fewer among foundries and casting consumers, and there appears to be somewhat better feeling in the trade.

In most lines of castings, however, business still lags considerably, with the probability that there will be no material upswing until after Labor Day.

Gray iron jobbers are operating three to four days a week. Except for a modest influx of automotive die work, there has been little change in demand. In general, requirements for machine tools and industrial equipment are spotty. Steel casting operations also average three to four days a week, with deliveries on plain castings two to three weeks. Alloy or special treatment work usually runs four to five weeks.

Malleable operations have been sustained at a somewhat better rate than in the other ferrous lines. While not operating with full work-

ing force, they are averaging around four to five days a week. Fittings and hardware and electrical equipment applications appear to be in good demand.

A better feeling is noted among brass and bronze shops. They say that buying is more orderly and that the consumers are making an effort to build up their inventories for the first time in months. Ship work is good and there is a definite improvement in meter business, with captive shops beginning to farm out specifications for the first time in some while. Industrial pump specifications are active, and there is a better demand for plumbing supplies. Brass and bronze shops are running four to five days a week with somewhat restricted personnel. Light metal shops are operating moderately well.

Chicago— To appraise prospects for sales of castings during the remainder of 1958, foundries are closely scrutinizing business indicators for clues. Of some interest, therefore, may be the report given by the executive committee of the American Steel Warehouse Association at its July 10 meeting here.

The warehouse industry is regarded as a sensitive barometer of business conditions, particularly in the manufacturing and construction industries. In essence, the report is mildly optimistic.

A slight but steady increase was reported in shipments from steel service centers during both May and June. Improved demand for steel from the construction industry as well as from manufacturers whose inventories have reached the danger point were cited as the two main reasons for betterment. Offsetting these favorable influences were more and longer plant vacation shutdowns and the general slowness of the automotive industry.

"Present indications are that we will have a sizable boost in shipments in the fall and winter months," said Robert G. Welch, the association's executive vice president.

Reports for June indicate Chicago and other regions heavily dependent on agriculture showed substantial increases in steel shipments, while areas tied to the automotive and capital goods industries had only a modest pickup in recent weeks.

Improvement in oil field activity will be a further aid to better steel shipments in Oklahoma and Texas. The South showed a gain in June, while some local factors have been holding back a pickup on the West Coast.

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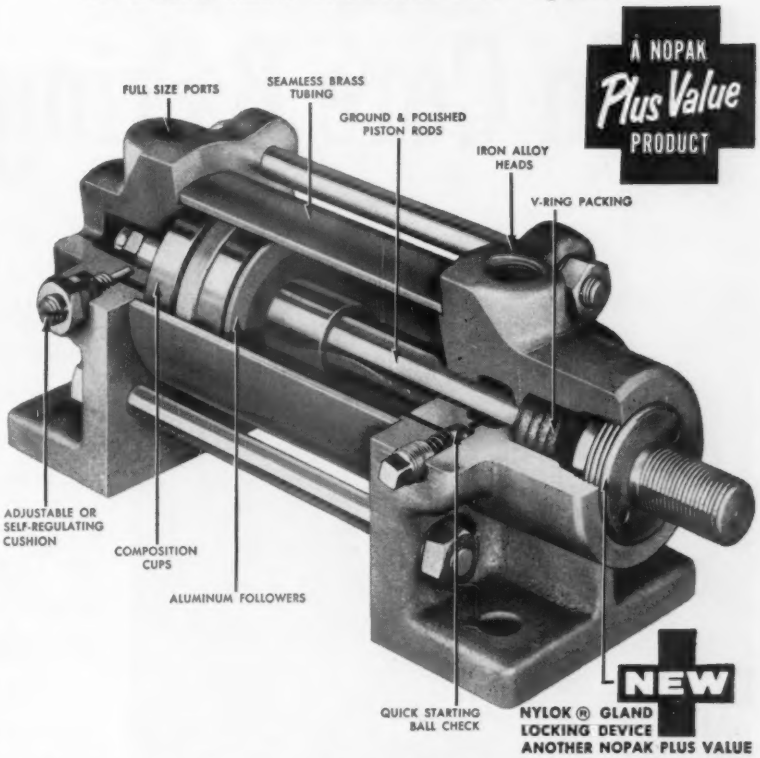

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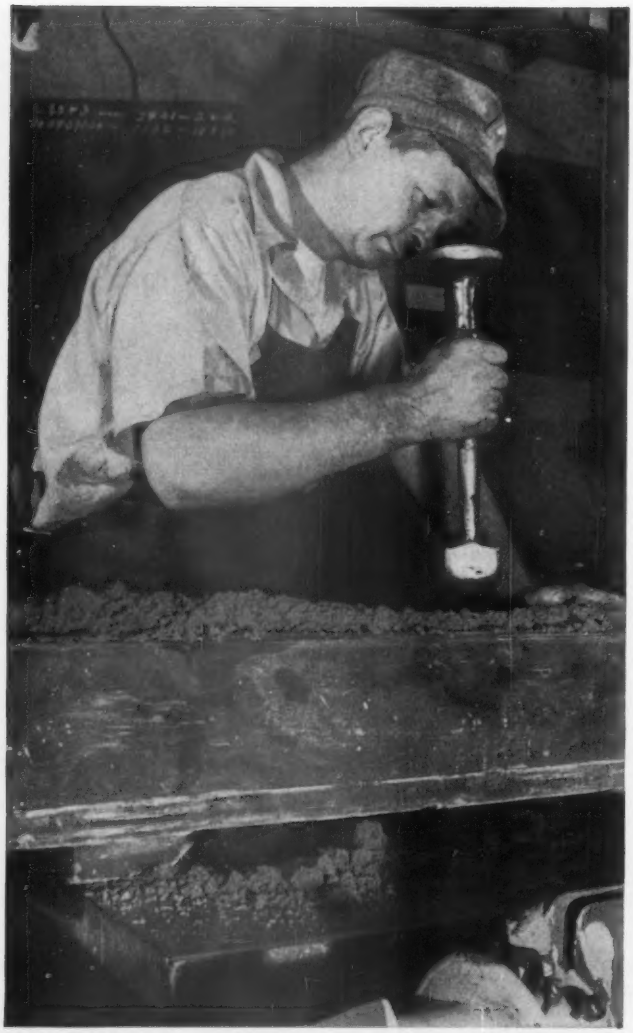

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Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1956	794,581	171,181	245,421	376,230	.....
1957					
Apr.	68,284	14,287	20,376	33,493	98,113
4 mo.	285,261	55,768	86,020	142,519	.....
May	65,108	12,705	20,708	31,602	94,748
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
Sept.	58,692	11,367	17,820	24,900	93,720
Oct.	64,140	11,570	20,543	31,936	91,817
Nov.	58,898	10,411	18,611	29,793	91,860
Dec.	53,102	9,302	16,724	26,978	86,323
Total	751,656	144,151	232,326	369,086	.....
1958					
Jan.	57,845	10,724	18,082	28,937	77,067
Feb.	50,695	9,601	15,456	25,279	75,647
Mar.	50,547	9,311	15,255	25,918	63,600
Apr.	44,948	9,531	13,369	21,956	60,317
4 mo.	204,035	39,167	62,162	102,090	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1956	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
Apr.	80,271	51,320	65,990	42,810	14,281	8,510	83,116
4 mo.	322,289	197,868	267,650	166,446	54,619	31,422	.....
May	76,504	46,277	63,058	38,072	13,446	8,205	79,787
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,100	27,290	12,648	7,586	80,694
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
Sept.	62,457	38,397	52,281	31,658	10,176	6,739	83,385
Oct.	77,667	45,989	66,043	39,269	11,624	6,720	82,995
Nov.	67,904	38,085	55,564	31,036	12,340	7,049	80,074
Dec.	60,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Jan.	62,734	34,920	51,440	28,516	11,294	6,404	67,292
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	59,047
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	54,330
Apr.	50,695	29,388	41,794	23,605	8,901	5,783	47,664
4 mo.	219,777	124,938	182,081	101,835	37,766	23,103	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1956	966,306	866,545	57,522	.....
1957				
Apr.	77,167	69,141	4,316	48,148
4 mo.	308,694	275,947	17,459	.....
May	75,347	67,251	4,421	46,791
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
Sept.	70,804	64,470	3,243	40,298
Oct.	81,836	74,391	3,693	39,063
Nov.	70,187	63,944	3,006	34,249
Dec.	65,708	59,606	3,046	31,509
Total	875,389	788,319	44,696	.....
1958				
Jan.	69,707	63,294	3,327	30,341
Feb.	58,356	52,579	3,202	27,243
Mar.	60,157	54,007	3,395	25,434
Apr.	59,311	53,271	3,385	25,621
4 mo.	247,531	223,151	13,309	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1956	36,168	33,580	.....
1957			
Apr.	2,896	2,723	7,542
4 mo.	11,734	11,017	.....
May	2,832	2,706	7,188
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
Sept.	2,279	2,071	5,705
Oct.	2,192	2,093	5,318
Nov.	1,920	1,806	4,802
Dec.	1,533	1,408	4,823
Total	30,322	28,452	.....
Jan.	1,881	1,756	5,227
Feb.	1,803	1,730	5,589
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
4 mo.	7,874	7,487	.....

PRODUCTION WORKERS

Estimated Number

	March 1958	Feb. 1958	March 1957
Ferrous	165,600	172,900	203,300
Nonferrous	51,200	52,000	68,000

Average Weekly Earnings

Gray Iron	$79.52	$78.94	$82.99
Malleable Iron	83.39	84.45	83.50
Steel	89.65	90.38	97.86
Nonferrous	89.71	89.24	91.58

Average Weekly Hours

Gray Iron	35.5	35.4	38.6
Malleable Iron	36.9	37.7	39.2
Steel	37.2	37.5	42.0
Nonferrous	38.5	38.3	40.7

Source: Bureau of Labor Statistics.

GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

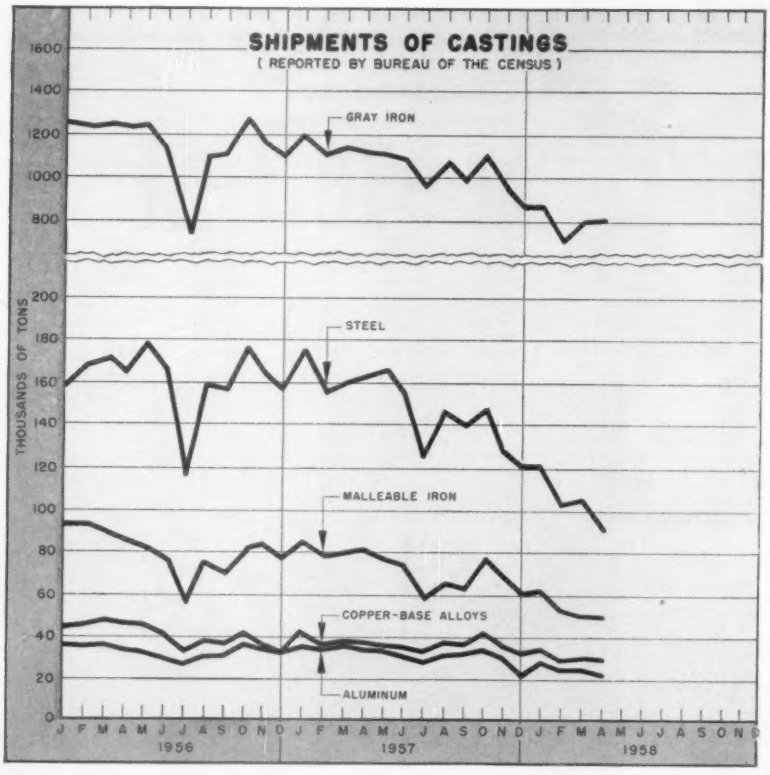
	All Castings		Miscellaneous Castings		Nodular Iron Castings	Heavy Steel Ingot Molds	Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	Total	Total	Total[3]	Total[3]	
1956	13,860,527	7,963,135	8,265,526	3,650,735	.....	2,624,146	406,191	1,746,902	817,762	.....
1957										
Apr.	1,120,349	611,443	699,395	298,319	10,235	192,199	36,979	128,710	63,066	899,074
4 mo.	4,569,828	2,440,251	2,880,444	1,225,995	.....	899,061	135,192	427,085	228,045	.....
May	1,112,096	625,496	674,460	291,557	11,206	192,336	34,406	141,685	69,209	879,825
June	1,058,464	599,494	630,513	274,115	10,207	193,640	32,087	131,360	70,864	853,012
July	954,102	523,489	565,897	243,187	10,901	190,434	31,209	106,532	60,030	825,676
Aug.	1,075,957	596,779	630,130	265,185	10,339	205,655	28,976	138,209	72,987	825,676
Sept.	990,139	563,477	579,444	259,649	10,253	202,914	23,681	119,689	64,411	805,301
Oct.	1,099,554	601,109	668,895	282,024	11,974	210,521	26,306	122,149	71,683	740,169
Nov.	940,138	482,732	599,292	242,847	10,601	166,652	24,302	91,138	58,754	704,623
Dec.	864,226	443,670	557,154	226,356	9,810	148,074	23,173	73,500	62,325	675,838
Total	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Jan.	868,255	436,398	580,545	229,014	10,800	135,110	23,511	78,863	50,226	638,069
Feb.	753,306	389,708	503,175	203,717	10,245	116,168	25,959	67,606	40,398	632,490
Mar.	795,568	446,822	499,751	215,916	9,485	125,887	24,777	87,716	57,437	589,912
Apr.	806,720	457,498	483,999	210,344	8,015	121,489	25,401	112,292	63,539	582,446
4 mo.	3,223,849	1,730,426	2,067,470	858,991	38,545	498,654	99,648	346,477	211,600	.....

STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1956	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Apr.	162,498	124,549	29,708	122,894	93,512	27,624	39,604	31,037	2,084	497,632
4 mo.	646,724	504,458	117,001	484,177	374,991	108,106	162,547	129,467	8,841	.....
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
June	153,647	119,353	31,338	116,759	91,009	28,766	36,888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33,641	113,167	86,407	31,639	32,759	24,673	2,002	471,190
Sept.	139,002	105,611	29,718	106,261	80,871	27,885	32,741	24,740	1,863	438,510
Oct.	146,397	113,216	31,477	110,100	85,144	29,320	36,297	28,072	2,157	395,907
Nov.	127,115	98,436	26,892	93,343	71,846	25,105	33,772	26,590	1,787	362,948
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Jan.	120,722	94,717	22,545	87,525	68,203	21,115	33,197	26,514	1,430	304,907
Feb.	103,297	79,708	16,647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
Apr.	91,464	69,121	11,956	65,639	48,998	11,107	25,825	20,123	849	229,503
4 mo.	421,716	325,741	67,328	305,011	234,190	62,735	116,705	91,521	4,593	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1956	74,454,264	73,814,941	2,856,395
1957			
Apr.	6,436,259	6,396,886	227,609
4 mo.	26,404,570	26,603,509	932,012
May	6,631,807	6,521,105	220,063
June	6,361,611	6,317,615	188,877
July	6,501,595	6,375,616	180,698
Aug.	6,519,973	6,401,949	206,907
Sept.	6,296,519	6,186,475	199,226
Oct.	6,275,567	6,120,485	208,720
Nov.	5,615,746	5,425,296	199,052
Dec.	5,164,965	5,099,556	173,470
Total	75,772,353	74,961,606	2,509,025
1958			
Jan.	4,762,050	4,643,022	192,098
Feb.	4,078,728	4,030,849	171,362
Mar.	4,343,326	4,208,343	168,194
Apr.	3,835,165	3,595,437	152,935
4 mo.	17,019,269	16,477,651	684,589

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1957	1958
Jan.	25,681	20,468
Feb.	20,769	17,413
Mar.	21,948	18,825
Apr.	23,507	18,009
May	22,037	17,191
June	18,888	.....
July	16,695	.....
Aug.	19,654	.....
Sept.	19,670	.....
Oct.	22,800	.....
Nov.	19,767	.....
Dec.	16,875	.....
Total for year	248,291	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOYS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1956	693.728	449.516	.....
1957			
Apr.	54,982	34,801	59,534
4 mo.	244,117	154,163	.....
May	53,565	35,676	66,712
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
Sept.	47,736	33,838	68,122
Oct.	62,332	39,990	69,275
Nov.	58,689	35,005	63,665
Dec.	49,597	29,998	58,792
Total	663,600	425,334	.....
1958			
Jan.	50,568	30,368	55,883
Feb.	42,687	27,482	50,676
Mar.	39,719	26,782	43,366
Apr.	35,796	23,830	27,634
4 mo.	168,770	108,462	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1957	1958
Jan.	117.9	57.9
Feb.	188.4	57.6
Mar.	127.0	85.9
Apr.	101.1	88.7
May	136.2	....
June	187.5	....
July	98.6	....
Aug.	231.3	....
Sept.	113.9	....
Oct.	145.3	....
Nov.	59.6	....
Dec.	61.4	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1956	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Mar.	6,294,038	814,372	92,534	903,149
3 mo.	18,963,278	2,493,321	289,218	2,665,491
Apr.	5,816,309	835,027	97,289	807,922
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
Aug.	5,299,543	765,877	81,941	759,517
Sept.	5,033,998	721,125	82,948	672,597
Oct.	5,333,767	817,338	91,766	718,791
Nov.	4,858,489	716,095	72,871	589,879
Dec.	4,281,414	661,918	70,091	542,008
Total	65,688,592	9,220,405	1,026,951	8,876,400
1958				
Jan.	4,072,071	704,654	76,989	566,225
Feb.	3,491,441	611,394	64,971	466,657
Mar.	3,718,132	624,165	64,866	524,035
3 mo.	11,281,644	1,940,213	206,826	1,556,917

PIG IRON PRODUCTION AND CONSUMPTION

	Production**—Net Tons Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption*—Gross Tons Total	Cupola	Air	Electric
1956	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	66,967,618	4,786,011	261,377	211,193
1957									
May	6,877,052	258,638	313,583	5,720,212	584,619	5,862,966	362,085	19,201	17,869
5 mo.	34,673,160	879,462	1,628,778	28,913,552	3,251,368	.....	.....	.....	.....
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
July	6,625,901	221,929	336,590	5,515,736	551,646	5,558,702	306,119	14,735	17,992
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	5,769,995	349,988	17,540	25,948
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	5,645,036	321,728	17,084	28,638
Oct.	6,454,450	164,944	303,104	5,390,851	595,551	5,669,624	354,364	18,466	24,691
Nov.	5,711,242	153,722	290,547	4,759,255	507,718	5,073,898	309,674	14,886	17,199
Dec.	5,212,624	165,268	228,897	4,394,869	423,590	4,565,635	288,219	14,754	13,881
Total	78,557,011	2,275,789	3,697,335	65,131,684	7,452,203	67,902,434	4,160,891	218,178	246,851
1958									
Jan.	4,785,269	100,097	232,862	4,036,451	415,859	4,208,692	306,794	16,102	14,426
Feb.	4,016,276	106,921	193,429	3,396,382	319,094	3,551,679	260,940	14,014	7,740
Mar.	4,418,778	156,386	227,785	3,645,353	389,254	3,824,140	270,214	13,472	8,753
Apr.	3,787,907	136,180	173,139	3,053,634	424,954	.....	.....	.....	.....
May	4,048,328	127,438	165,045	3,359,836	396,009	.....	.....	.....	.....
5 mo.	21,056,477	627,022	958,558	17,491,656	1,945,170	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

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Circle 658 on Page 103

Foundry Group Meetings

Oregon—Annual Northwest Regional Conference of the AFS is scheduled for Friday and Saturday, Oct. 31-Nov. 1, at the Multnomah Hotel, Portland. The program will include two days of technical discussions, with a banquet Friday evening and a dinner dance Saturday evening.

Among the subjects tentatively selected for discussion are the following: Plant Layout, Material Handling, Work Simplification, Comparison of Molding Methods, Modern Coremaking Methods, and New Core Processes.

Frederick M. Menzelm, Rich Mfg. Co., Portland, is general chairman of the Conference Committee. Anthony A. Belusko, Electric Steel Foundry Co., Portland, is in charge of program arrangements.—*Norman E. Hall, Electric Steel Foundry Co.*

Want core plates that SAVE MONEY?

. . . then use TRANSITE CORE PLATES

for easy handling, low maintenance, long life!

You get real long term economy with Transite* Core Plates. Their initial cost is low . . . and their maintenance cost negligible. Transite Core Plates are tough and corrosion-resistant. They are made from an asbestos and cement composition by a special Johns-Manville process. They resist shock and corrosion . . . will not crack or break easily.

Here are other important reasons for using Transite Core Plates:

THEY SPEED PRODUCTION—
Transite Core Plates are easily handled. They're simple to clean, too, since core wash, sand, etc. do not adhere to them as readily as to other core plate materials.

THEY MAINTAIN ACCURACY—
Foundrymen who have used Transite Core Plates for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time.

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Johns-Manville TRANSITE CORE PLATES
Made of Asbestos

Twin City—At the AFS chapter's meeting held May 13 at the Jax Cafe, Minneapolis, Jeff A. Westover, Westover Corp., Milwaukee, was the principal speaker. His topic was "Quality Control for the Small Foundry."

The speaker stated that when a worker inspects his own work, the standard of quality must be spelled out and well defined. It is desirable to have one person responsible for quality control who will also check all new patterns, check sample castings, and establish gates and risers for patterns.

Mr. Westover further stated that in a survey conducted by the Gray Iron Founders' Society, it was proved overwhelmingly that customers place quality ahead of price and service as a factor in purchasing metal castings. Slides were shown to illustrate types of inspection.

The chapter also elected officers and directors to serve during the coming year. Robert J. Mulligan, supervisor of foundry research and development, Archer-Daniels-Midland Co., was elected chairman.—*J. David Johnson, J. David Johnson Co.*

Wisconsin—Two speakers who talked on the "Old and New Foundry Look in Europe" were featured at the AFS chapter's annual Oldtimers and Apprentices night meeting, May 9. Clyde A. Sanders, American Colloid Co., Chicago, who recently returned from visiting 84 foundries in nine countries, reviewed new and important trends in European foundry practice. William Illuminati, American Automation Corp., Ann Arbor, Mich., showed a motion picture of an automatic foundry installation at George Fischer Ltd., Schaffhausen, Switzerland (see FOUNDRY, June, 1958, page 70).

5 REASONS FOR CLEVELAND TRAMRAIL CORE-HANDLING EQUIPMENT

Above: After baking the racks are taken directly to molding floor. No time-consuming rehandling of cores.

Below: Coremakers' plates of cores are placed on racks conveniently located. When racks are loaded, they are propelled into ovens.

1 ELIMINATES REHANDLING — Delivers cores from coremaker to oven, thence to molding floor, via overhead tramrail route without rehandling.

2 CUTS COSTS — Saves time, speeds production, cuts costs. Coremakers spend more time making, less time handling cores.

3 REDUCES BREAKAGE — Easy operating carriers on smooth overhead track eliminate damaging vibrations and shocks. No chafing, cracking, or breaking of cores in transit.

4 NO REINFORCEMENT WIRES — Because of cushion-like handling with Cleveland Tramrail reinforcement wires can be eliminated for many cores. (Removing core wires sometimes costs more than cores themselves.)

5 WITHSTANDS OVEN TEMPERATURES — Cleveland Tramrail carriers are designed for usual oven temperatures up to 450 degrees F. No "sticky" wheel bearings.

Cleveland Tramrail core-handling equipment is inexpensive. It is easy to install in present plants. It is ideal for use through continuous baking ovens.

Now is the time to consider establishing real efficiency in your core department. Have an experienced Cleveland Tramrail sales engineer offer you recommendations — no obligation, of course.

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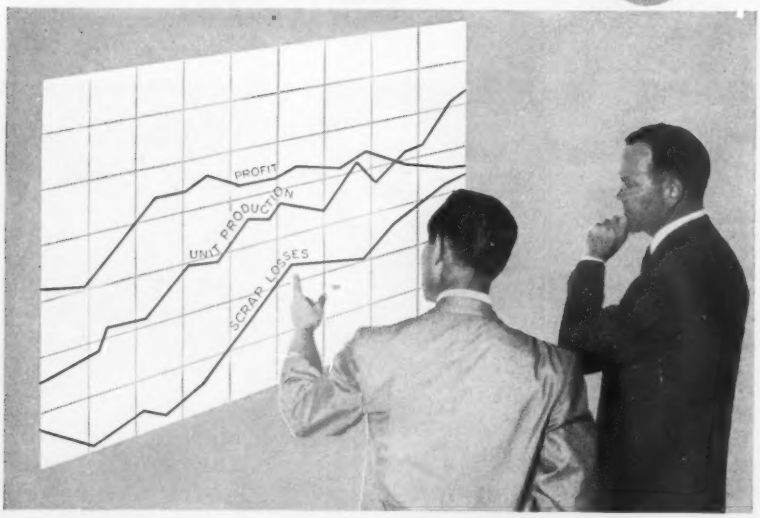
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 660 on Page 103

CAN YOUR FOUNDRY REMAIN COMPETITIVE with HIGH SCRAP LOSSES



IF HIGH SCRAP LOSSES are seriously affecting your profit picture . . . a Dietert-Detroit Sand Control program can help your foundry. Let's first answer the following questions:

WHAT TYPE OF FOUNDRY DO YOU OPERATE?

☐ No sand control. High scrap losses.

☐ Good routine sand control. Good production rate. Low scrap losses.

☐ Faithfully supervised sand control program. High production rate. Planned research. Low scrap losses.

ARE ONLY LARGE FOUNDRIES ABLE TO AFFORD ADEQUATE SAND CONTROL?

No. The total cost of Dietert-Detroit equipment required to control moisture, permeability and strength is but *$1051.50.*

DOES A SAND CONTROL PROGRAM REQUIRE ADDITIONAL TRAINED PERSONNEL?

No. Any careful, practical man can unpack equipment, set it up on a bench, and learn how to obtain accurate test data within 1½ hours.

HOW DOES THIS PROGRAM HELP US?

Check sand used in production several times a day. Takes only 10 to 20 minutes. Check sand test data with results of castings produced. Within one week you will have facts and figures to guide you in working your sand at the moisture, permeability and strength values that give you the best looking castings, and with your *lowest scrap losses.*

Start this program today. You can start reducing your scrap losses within one week. Use attached coupon for additional details.

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Company_____

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City_____ Zone_____ State_____

Six new members of the Oldtimers group were presented plaques. An oldtimer has spent at least 50 years in the industry, and there are now 170 in the group.

Winners of the chapter's apprentice contest were present at the dinner to receive certificates and cash prizes. They included the following: Steel molding—Elden Willing, Gordon Wambold, and Arnold See, all from Waukesha Foundry Co., Waukesha, Wis. Gray iron molding—Ronald McConville and Myron Benowski, Nordberg Mfg. Co., Milwaukee, and Jack Pechacek, Allis-Chalmers Mfg. Co., Milwaukee. Nonferrous molding—Paul Gauger and Harold Jost, Eck Foundries, Manitowoc, Wis., and Clifford Rantenan, Allis-Chalmers Mfg. Co. Metal patternmaking — Maurice Kiante, Falk Corp., Milwaukee, and Robert Williams, Allis-Chalmers Mfg. Co. Wood patternmaking—Bronson Baker, Universal Foundry Co., Oshkosh, Wis.; Donald Dion, Falk Corp.; and George Reick, Nelson Pattern Co., Milwaukee.—*John E. Hubel.*

Northern California— First of the Andrew Ondreyco awards to the outstanding foundry apprentice in the San Francisco Bay area was made to Conrad Rost, Empire Foundry Co., Oakland, at the recent annual Ladies' Night dinner at Hotel Claremont, given by the Northern California Chapter of AFS.

The award consists of $100 in cash, an individual plaque to the winner, and the inscription of his name on a perpetual trophy to be kept on display at the International Molders and Foundry Workers Union Hall. This annual award is made possible through an anonymous donor as a memorial to Andrew Ondreyco, who was one of the outstanding foundrymen of the area. He served the chapter in many capacities, culminating in his chapter chairmanship in 1947-48.

Judging this year was done by Clayton Russell, Phoenix Iron Works, Oakland, chairman of the apprentice committee, assisted by Michael Ginty, Vulcan Foundry, Oakland, and Lane Currie, H. C. Macaulay Foundry, Berkeley. There were 63 apprentices contesting for the award. Judging was based on the apprentices' grades in their school work and through interviews with them and their supervisors.

The presentation was made by Harold Hirsch, American Manganese Steel Div., Oakland, retiring president of the chapter.—*Harold Henderson, H. C. Macaulay Foundry*

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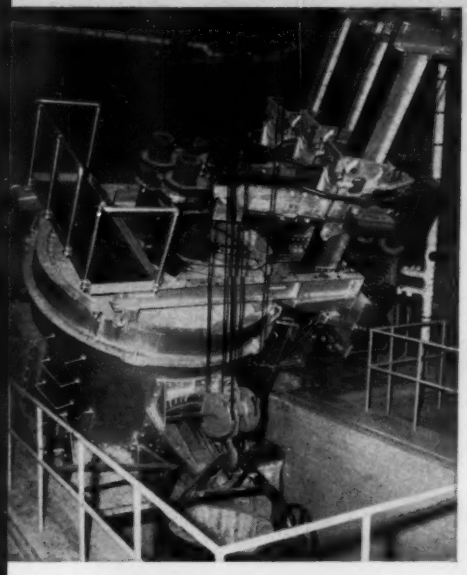

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- **RUGGED, OVERSIZED ROOF CYLINDER** in permanent engagement with roof superstructure insures proper sequence. No manual clamps or kingposts—no special foundation. Cylinder is powered to level pyramided charged scrap in seconds.
- **SIMPLE, LOW COST FOUNDATIONS.** No cable tunnels or elaborate cable reeving—electrode hoist and roof cylinders are integral with furnace for proven maximum "on the line" performance.
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- **REMOTE CONTROLLED ELECTRODE HOLDERS.** All vital parts out of heat and danger zone—yet accessible for quick visual inspection or maintenance.
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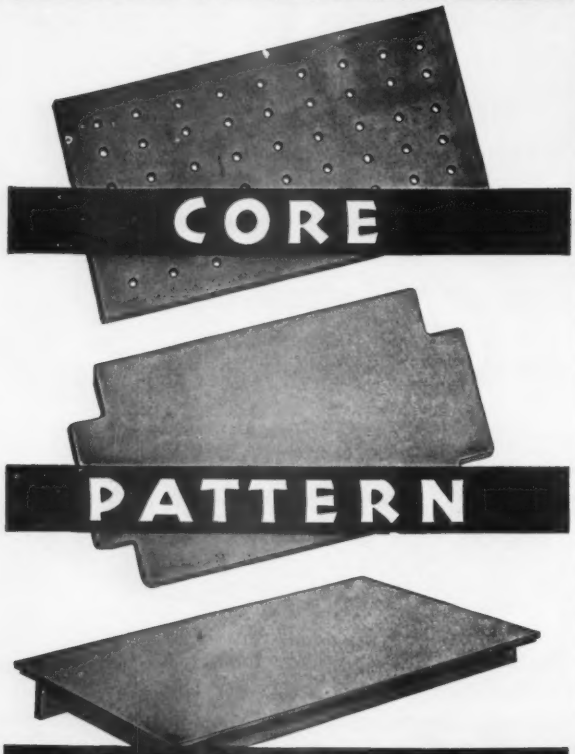

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Consequently your investment goes further and that *all-important profit-margin* increases. Plates are made to your specifications—we welcome the opportunity to furnish complete information.

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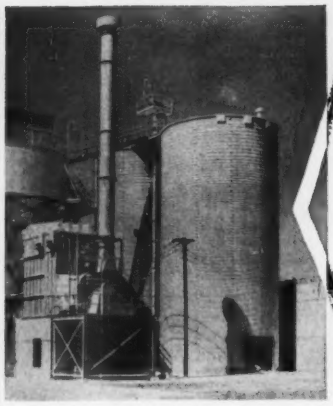

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Circle 664 on Page 103

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CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MECHANIZATION

Circle 665 on Page 103

EMPIRE*

"THAT GOOD"

FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION

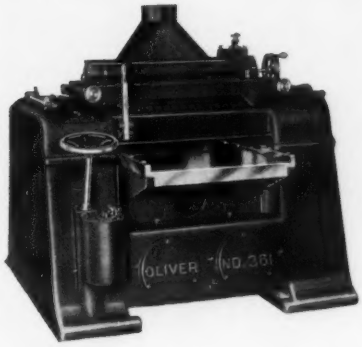
2201 First Ave., North • Birmingham 3, Ala.

Phone: ALpine 1-9135

*Reg. U.S. Pat. Off.

Circle 666 on Page 103

This OLIVER Planer will produce smooth accurate patterns quickly



Smoothly planes all woods up to 30" and 36" wide, up to 8" thick. Has one-piece inclined bed supported by one-piece wedge. One-piece base assures permanent alignment of working parts. Micrometer adjustment aligns bed and cylinder. Fully enclosed feed mechanism. Easy to operate. Write for Bulletin No. 361.

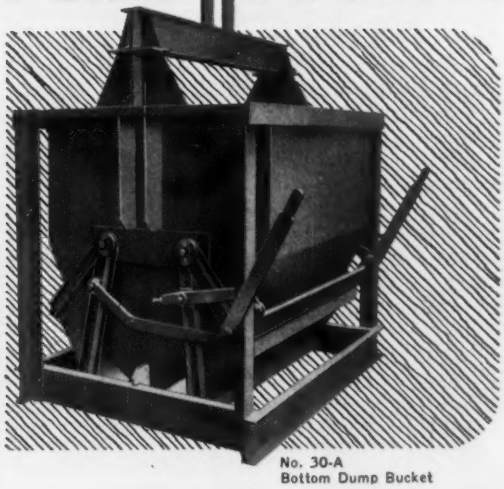
Oliver makes a full line of Planers, Jointers, Pattern Lathes, Millers and woodworking equipment for pattern shops

OLIVER SINCE 1890

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

Circle 667 on Page 103

PENN BUCKETS



No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

MEMBER FEMA

Write Today for Catalog • Prices Quoted on Application

PENN IRON WORKS, INC.
READING, PENNA.

Circle 668 on Page 103

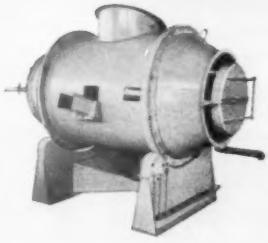
STROMAN

FURNACES For IRON or BRASS

Here are two exceptional Stroman Furnaces that will give you better melts, better castings and cut costs to the bone. Designed by the leading metallurgical engineers they will do their jobs more efficiently, faster and economically than old fashioned equipment. To compete in the foundry market you must modernize . . . and Stroman Foundry Equipment is the most modern and best you can buy.

INVESTIGATE THEM TODAY!

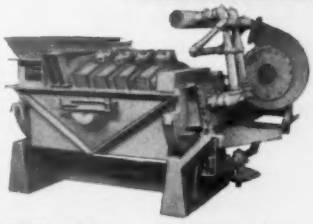
IRON MELTING



STROMAN TYPE "R.F." BARREL FURNACE

This open flame, barrel type furnace with burners firing tangent to the inside of the lining is designed to produce an ideal combustion arrangement for very tast melting of iron. It is applicable to jobbing gray iron foundries for its speedy melting cuts labor and fuel costs. It is easily charged. Capacities up to 20,000 lbs. iron.

BRASS MELTING



STROMAN TYPE "JC" CRADLE TYPE TILTING FURNACES

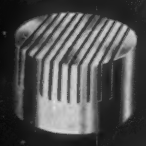
For melting COPPER BASE ALLOYS of low zinc content (not exceeding 7% zinc) these furnaces are the most economical available. Their rapid melting time, from 15 minutes up depending on the size of furnace assures lowest fuel consumption and as always in a Stroman Furnace maintenance is at a minimum. Operators are not exposed to excessive heat making excellent working conditions. They are recommended for production work. Capacities range from 400 pounds up to 20,000 pounds per heat.

Stroman makes all types of furnaces for the melting of brass, bronze, aluminum, iron, magnesium and all other non-ferrous metals. Write for new bulletin #150 describing Stromans complete line including metal handling and conveyor equipment.

STROMAN FURNACE AND ENGINEERING CO.
FRANKLIN PARK, ILLINOIS

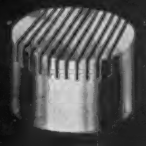
Circle 669 on Page 103

SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C.M. SMILLIE & CO.** 1124 WOODWARD HGTS., FERNDALE 20, MICH.

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
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- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
- FOR CLEANING SLOTS
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- EASY TO USE

Circle 670 on Page 103

Only from LENNOX industrial heaters

400,000 to 2,000,000 Btuh • VERTICAL OR HORIZONTAL APPLICATIONS

1 4-PASS COUNTER FLOW!
2 MASTER CONTROL PANEL!
3 STAINLESS STEEL COMBUSTION CHAMBER!
4 DOUBLE CASING WITH METAL RADIATION SHIELD!

Write for Engineering Data:

LENNOX Industries Inc.

Dept. F-8
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Des Moines, Iowa

Circle 671 on Page 103

HIGH SILICA QUARTZITE PEBBLES

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R. W. SIDLEY, INC.

THOMPSON, OHIO TEL. 2701

Circle 673 on Page 103

NCP makes effective PATTERN LACQUERS

1. Seals pattern to prevent moisture and water absorption.
2. Brushes easily—dries quickly.
3. Does not chip, peel, bubble, or blister, and is flexible.
4. Adds slip, promoting clean parting of pattern from sand.
5. Made in all colors.
6. Time tested material—successfully used in pattern shops all over the country for over 30 years.

The National Chemical & Plastics Co.
1424 Philpot Street Baltimore 31, Maryland

Circle 674 on Page 103

A NEW COST MANUAL for the Gray Iron Castings Industry (NO. 2)

Here in 120 carefully planned pages is a complete Cost Account System for both a small foundry with minimum accounting facilities and a large foundry capable of detailed cost determinations for accuracy and completeness.

Price $10.00 Postpaid

Two cost manuals under one cover—Cost Manual No. 1, representing twenty years of editing and revising by practical operating experts in the industry, is included as a supplement.

The more thorough treatment of the subject found in the new manual was dictated by the considerations of economy in dealing with the higher priced labor and material factors and a relentless desire to probe for hidden costs from wasteful and nonprofitable activities.

GET YOUR NEW COMPLETE COST SYSTEM FOR FOUNDRIES

FOUNDRY, Book Dept., 1213 W. 3rd St.
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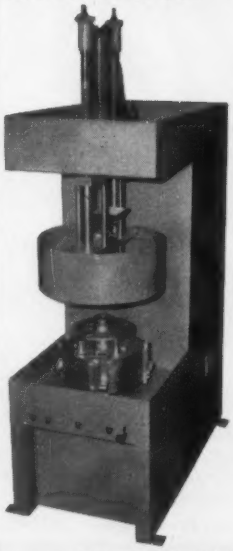
Please forward one copy of COST MANUAL NO. 2, at $10.00 postpaid. ☐ Check enclosed.

NAME _____
ADDRESS _____
CITY _____ STATE _____

Orders for delivery in Ohio—add 3% sales tax.

Circle 672 on Page 103

CENTRIFUGAL CASTING MACHINES ... WITH STANDARD PARTS AND EQUIPMENT CAN BE ... CUSTOM BUILT



We make machines capable of producing castings weighing MANY TONS as well as machines to produce castings weighing a FEW OUNCES.

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Some machines are designed for long-run repetitive production, while other special machines are most suitable for short runs of varying sizes and types of castings.

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WE FURNISH INFORMATION ON HOW TO MAKE CENTRIFUGAL CASTINGS

INQUIRIES INVITED

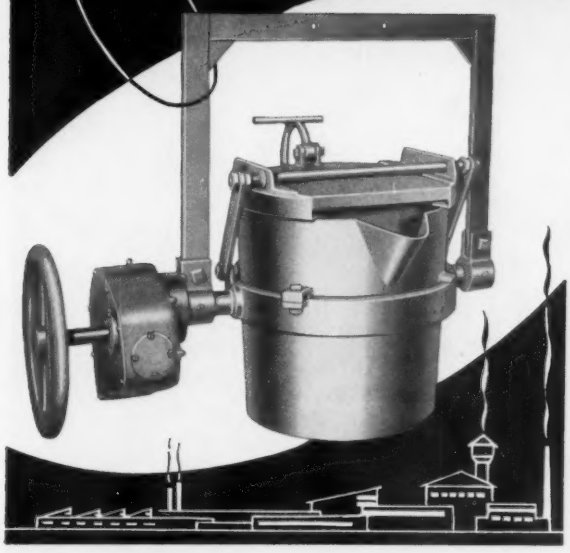
INVESTIGATE THE POSSIBILITIES OF MAKING YOUR CASTINGS CENTRIFUGALLY ... TODAY.

CENTRIFUGAL CASTING MACHINE CO.
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 675 on Page 103

JOB ENGINEERED by Industrial

YOU SEE THE DIFFERENCE WHEN YOU START TO POUR



All ladles look pretty much alike . . . but your crews can see and *feel* the Job Engineered advantages of Industrial ladles as soon as they start to pour.

Industrial Job Engineered ladles handle smoothly and easily through the entire pouring routine—tipping, making the pour, straightening and moving on to the next mold. Industrial's special gearing assures precise ladle control at all times . . . and eliminates binding as a result of heat distortion of ladle bowl. One man can easily handle the entire pouring operation. That's why Industrial ladles pay off in lower costs, more efficient operation every time your crews pour a casting.

The ladle shown is for smaller pouring jobs. It is equipped with Bantam Gearing, and offers all the Job Engineered features of Industrial's larger ladles—dependability, ease of operation, accuracy, no binding, one man handling. Send your pouring problems to Industrial Equipment Company—manufacturer of a complete line of standard and custom pouring and handling equipment—Bowls . . . Shanks . . . Bails . . . Tongs. Write today for latest catalog.

Industrial
EQUIPMENT COMPANY
115 OHIO ST., MINSTER, OHIO

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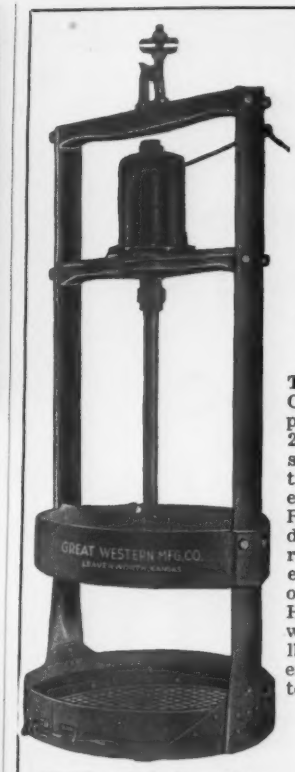
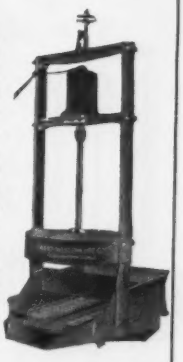


MOST ADVANCED SCREENING MACHINE ON THE MARKET!

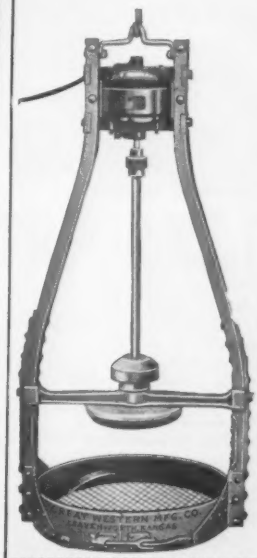
COMBS GYRATORY RIDDLES

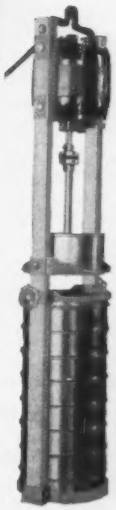
"The Greatest Name in Motion"

TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs., ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., ⅓ H.P. enclosed motor.





TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

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Leavenworth, Kansas Phone MU-22291
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for efficient
desulphurization
at low cost...
Diamond
Foundry
Grade
ASH

Diamond Alkali's dust-free, coarse particle Soda Ash will give you greater efficiency and economy in your desulphurization operations. Diamond's years of experience as one of America's largest producers of soda ash are at your service. Call your nearby Diamond Sales office, or write Diamond Alkali Company, 300 Union Commerce Bldg., Cleveland 14, Ohio.

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FOR BETTER CASTINGS...
UNIVERSAL
refractory gating components

Splash Cores
Strainer Cores

Determine proper gating faster, eliminate slag inclusions, stop rejects, reduce cleaning room time, and lower production costs. UNIVERSAL *refractory* gating components will help you do this, and at less cost than producing your own from sand. Send specifications for price and delivery quotations, or call MA 6-4912

WRITE TODAY FOR CATALOG LISTING SPECIFICATIONS OF STANDARD GATING COMPONENTS

Pouring Tubes

UNIVERSAL CLAY PRODUCTS CO.
1515 EAST FIRST ST. • SANDUSKY, OHIO
Circle 678 on Page 103

STOP "KICKING" YOUR SAND AROUND
and give it RINGLIFT Conditioning!

The RINGLIFT Sand Conditioner gets all sand up off floor, screens, magnetically separates, aerates, cools, adds moisture, mixes, and deposits in neat windrows. Velvety, open sand that assures much better castings. Real economy — up to a ton of sand per minute. Get a user's opinion! Send for bulletin.

STATES ENGINEERING CORPORATION
920 W. Berry St.
Fort Wayne, Indiana
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MURPHY PISTOL SPRAYER

Forces blackening into pores and pockets of molds. Sprays Silica wash, oil, or water equally well. Use it also to sand blast or as a blow gun.

Standard of the foundry field for over 50 years. Stocked by leading foundry supply houses. Guaranteed by . . .

JAMCO

2673

JAS. A. MURPHY & CO., INC.
1425 EAST HIGH STREET, HAMILTON, OHIO

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Circle 680 on Page 103

AMERICA ALWAYS OUTPERFORMS ITS PROMISES

We grow so fast our goals are exceeded soon after they are set!

7 BIG REASONS FOR CONFIDENCE IN AMERICA'S FUTURE

1. More People—Four million babies yearly. U. S. population has *doubled* in last 50 years! And our prosperity curve has always followed our population curve.

2. More Jobs—Though employment in some areas has fallen off, there are 15 million more jobs than in 1939—and there will be *22 million more* in 1975 than today.

3. More Income—Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.

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5. More Savings—Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.

6. More Research—*$10 billion* spent each year will pay off in more jobs, better living, whole new industries.

7. More Needs—In the next few years we will need more than *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

FREE! Send for this new 24-page illustrated booklet, "Your Great Future in a Growing America." Every American should know these facts. Drop a post card today to: THE ADVERTISING COUNCIL, Box 10, Midtown Station, New York 18, N. Y.

Circle 676 on Page 103

CLASSIFIED ADVERTISING

Help Wanted

PLANT METALLURGIST

A challenging position in a progressive steel foundry located in the Midwest. Qualifications include being a graduate Metallurgist with STEEL foundry experience. In reply to this advertisement, give full particulars, including age, education, and experience. Salary commensurate with experience. All replies held in strict confidence.

BOX 157, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GRAY IRON FOUNDRY SUPERINTENDENT

Well established Chicago gray iron foundry specializing in job lot production of the highest quality machine tool castings, is seeking a foundry superintendent. Applicant must have a sound knowledge of foundry practice and at least ten to fifteen years' experience in medium and heavy casting work. Practical experience in coremaking, molding, melting and cleaning is necessary. Some technical training is highly desirable. Replies confidential. Send fully detailed resume giving experience, training and salary requirements.

BOX 158, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HELP WANTED

Nonferrous foundry, located in New York City, operating a pattern shop, machine shop and a twelve molder aluminum and bronze foundry. Seeking a man 25 to 45 to take over Sales and assist the President in management.

Good opportunity for an experienced man, with a good knowledge of nonferrous castings, patterns and possessing ability to read blueprints.

EASTERN PATTERN & FOUNDRY CORP.
548 WEST 27TH STREET
NEW YORK 1, NEW YORK

FOUNDRY METALLURGICAL ENGINEER

Foundry metallurgical engineer wanted for nonferrous foundry. Must have experience on problems of gating, risering, pouring, sands and cores. B.S. Degree in Engineering required. Must have minimum of five years' experience. Age 25-45. Excellent opportunity for capable and energetic man. Salary open. Please reply stating your personal data, qualifications, experience, salary expected and availability in first letter. All inquiries will be held in strict confidence. Direct all correspondence to: AMPCO METAL, INC., PERSONNEL DEPARTMENT, 1745 SOUTH 38 STREET, MILWAUKEE 46, WISCONSIN.

SUPERINTENDENT

Good opportunity for capable and energetic steel foundry superintendent for medium-sized steel foundry. Must be aggressive and understand thoroughly steel foundry jobbing operations. Must be cost conscious and capable of getting the most out of his foremen and men. Foundry is located in the middle west. Submit resume immediately. Address: Box 137, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Gray iron. Pennsylvania. Well experienced with technical ability. Knowledge of production, metals, patterns, cupolas, sand, mechanization and automation. Personality and availability a factor. References required. Opportunity for advancement to Executive Management. Address: Box 146, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

ESTIMATOR-ENGINEER

Prepare cost estimates from blueprints and standard data for wide variety of Aluminum Sand Castings for bidding purposes.

High degree of interest in mechanics with some experience in machine and/or tool design desired, since estimator also assists in design of pattern equipment for production.

A good position with a company established in 1875.

OBERDORFER FOUNDRIES, INC.
c/o PERSONNEL DIRECTOR
SYRACUSE, NEW YORK

METALLURGIST

For Southern California steel foundry. Carbon steel, alloy steel, straight chrome and stainless steel castings. Must be well qualified and able to run chemical analysis. Will be responsible for setting up and following the heat treatment and necessary metal tests. Age bracket thirty to fifty years. Salary open.

BOX 156, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

EXECUTIVE ADMINISTRATOR

With plenty of experience in sales, finance, gray iron foundry castings. Excellent personality and maturity absolutely necessary. Must be available immediately. Give references. Address: Box 159, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TIME STUDY ENGINEER

To develop and apply standard data, five years' minimum experience, preferably in foundry; highly mechanized Wisconsin foundry. Send personal summary and salary requirements. Address: Box 145, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

SUPERVISOR, PLASTER FOUNDRY

Strongest at the making of pressure cast pattern equipment, then precision and prototype castings, foam rubber molds, some tire mold castings. Most nonferrous metals have been used with the plaster molding. Twenty years' experience. Address: Box 150, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Graduate metallurgist, five years' gray iron experience including casting development, plant metallurgy, cupola operation, sand control and quality control. Seeking position in medium-sized gray iron foundry. Address: Box 152, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON METALLURGIST

Nineteen years in jobbing, heavy machinery, and automotive shops. Experienced in cupola, sand and casting control. Illinois Tech trained. Age 47. Will relocate. Salary open. Address: Box 149, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 116, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Steel or iron. Coat off, sleeves up type of man. Jobbing or mechanized. Address: Box 153, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

MANAGEMENT

Qualified metallurgist, 36, extensive knowledge production and control high quality gray, alloyed, flake and spheroidal iron castings; cupola, molding and sand control; chemical, mechanical and micro testing. Presently five years service engineer, Meehanite Metal Corporation, but wish to cease extensive travelling. Interested in management end or part ownership of foundry. Address: CHARLES FORD, 670 E. LINCOLN AVENUE, MT. VERNON, NEW YORK.

FOUNDRY SUPERINTENDENT

With 27 years of supervisory experience, thoroughly versed in all phases of the ferrous casting industry (especially malleable). Present employer knows of this advertisement and can be contacted for complete information. Address: Box 147, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Progressive practical gray iron foundryman graduate metallurgist with thirty years' broad know-how experience producing quality castings. Well versed in metal and sand control cleaning rigging at minimum costs. Desire connection demanding results at once. Address: Box 155, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY WORKS MANAGER

Have complete knowledge of all gray iron operations. Want position with a free hand to attain maximum results. Mechanized or one that plans to modernize. If you have such need, I am your man. Address: Box 141, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT OPERATIONS

Experienced in molding, melting, sand, annealing, coremaking, metallurgy, pattern layout, gating and risering of malleable iron, gray iron and steel. B.S. degree plus two years technical foundry training. Age 36. Address: Box 164, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Young foundryman thoroughly versed in all gray iron operations. Degree in Metallurgical Engineering. Interested in responsible position with opportunity. Address: Box 138, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Age 34, fifteen years' foundry experience, three years as Meehanite supervisor. Know all operations of iron and steel foundries, production or jobbing shop. Fully qualified journeyman. Desire position with a future. Address: Box 113, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DISTRICT SALES MANAGER AVAILABLE

Cleveland, Northern Ohio, East. Good organizer accustomed to dealing with top level management. Excellent contacts. Proven record of casting sales and sales development. Will consider agency representation. Address: Box 140, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

QUALIFIED FOUNDRYMAN

Thirty years old, 12 years' practical and technical experience, six years' supervision, light and medium gray iron, desire to relocate in east or midwest. Resume upon request. Address: Box 143, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical and technical, 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 142, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Thorough knowledge of all phases of foundry operations and administrative functions. Desire opportunity where challenge exists. Age 39. Address: Box 119, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

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FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL

$5,000-$30,000. This nation-wide service successful since 1927 finds openings in your field. Sells your abilities; arranges contacts. Present position protected. Write for details. Address: JIRA THAYER JENNINGS, P. O. BOX 674, MANCHESTER, VERMONT.

Positions Wanted

INDUSTRIAL ENGINEER

Thirty-three year old graduate of General Motors Institute cooperative engineering program with 13 years' experience in metal casting field, including automotive gray iron, university instructing, technical writing, and pit molding job shop. Will consider any position related to the foundry industry that offers opportunity as well as challenge. For resume Address: Box 132, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Twenty-one years' experience in nonferrous foundry, specializing in aircraft aluminum, some shell molding. Free to relocate. Address: Box 162, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES-SERVICE ENGINEERING

Industrial Engineer, 12 years associated with foundry industry, desire opportunity in casting sales or sales-service of ideas, equipment or supplies to foundries. Address: Box 133, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TRAINED STEELMOLDER

German, living in Canada, age 22, with six years in various types of steel molding, seeking new connection. Willing to locate anywhere. Address: Box 114, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Age 42, 27 years' experience in all phases of gray iron foundry, practical and technical. Proven ability in ductile and high strength gray irons, basic or acid cupolas, jobbing and production. Address: Box 144, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 139, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Well-known ferrous—nonferrous foundryman and consulting authority on foundry practice desires a good permanent association with a progressive firm. Address: Box 151, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Gray iron, heavy class jobbing preferred. Locate in New England, New York or Pennsylvania only. Address: Box 134, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

With 25 years' experience processing castings of all kinds. Free to relocate. Address: Box 122, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

CONSULTING ENGINEER

Thirty-five years' Experience
Acid and Basic Practice

Improved methods in electric furnace melting. Low cost with high productivity. Avoid expensive mistakes. Acquire consultation prior to the purchasing of your new furnace and in planning, modernizing, and organizing of your melt shop.

EUGENE H. WEAK **2933 HIGHWAY AVE.**
HIGHLAND, IND. **PHONE: TEMPLE 8-1244**

FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Representative Wanted

FOUNDRY MACHINERY EQUIPMENT SALES

National manufacturer seeks qualified salesman to call on foundries and sell shell core blowing and resin coating machines and material handling equipment. Must be willing to travel and be experienced in calling on foundries. Kindly send complete resume or write for appointment.

BOX 148, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

Foundries For Sale

FOUNDRY FOR SALE

Owner, operator wishes to retire. Going gray iron, brass, aluminum jobbing foundry with living quarters and furniture. Long lease, low rent, water front property in deep south. Resort and industrial area, with new million arce industrial area under consideration. Nearest other foundry 80 miles. Silica, molding sands and fire clay in abundance. No. 2 cupola, Nos. 100 and 300 crucible pit furnaces. $20,000 cash or terms can be arranged. Address: Box 161, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Gray iron foundry serving the Southwest. Established 20 years. Property, buildings and equipment included. In operation at present. Owner's health reason for disposal. Address: Box 163, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOR SALE

Gray iron, up to 10 tons daily production. Completely equipped. Well established. Central Wisconsin. Personal reason for selling. Address: Box 154, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Wanted

FOUNDRY WANTED

Buy or lease operating iron foundry to produce jobbing casting or premium quality gray, nodular, and special service, high duty irons. Will consider partnership. Address: Box 120, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE
THE WAGNER PERMANENT MOLD CO., 2910

Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

NEW SHELL MOLD PROCESS

Blows cope and drag simultaneously, assembles, fuses automatically. Lower mold costs, closer tolerances. Patent applied for. Offer prints, engineering service and license. Address: THEODORE G. BAKER, 17044 BROADWAY TERRACE, OAKLAND 11, CALIFORNIA.

Wanted-To-Buy

WANTED

One electric, direct arc, steel melting, swing roof top charge tilting furnace with shell diameter 13 to 15 feet, complete with control and regulator panels, and transformer with 8,000 to 12,000 capacity. Primary voltage 13.2 KV, secondary range 100 to 300 volts approximately. Must be in first class condition throughout.

BOX 165, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED

#3161-16 or 3161-20 Osborn Roto-Lift Machine. Must be in good condition.

BOX 112, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

MOLDING MACHINES WANTED

One Milwaukee jolt-squeeze stripper, Model 216 also one Osborn Roto-Lift Model 3161. Address: Box 115, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FURNACE WANTED

One used Electric Arc Melting Furnace (11 to 13 ton charge), 11' diameter shell, basic—with or without furnace transformer. Address: Box 136, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

Used conveyor type pigging machine, to make cast iron pigs, also 4000 lb. mixing ladle hand operated. Address: Box 160, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

All of our foundry equipment, including two electric furnaces, cupolas, compressors, Wheelabrators, Surface Combustion box type oven, core ovens, molding machines, casting bins, in fact our complete foundry.

MEMPHIS CASTING WORKS, INC.
1006 OAKLAND AVENUE
MEMPHIS 1, TENNESSEE

CLASSIFIED ADVERTISING

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

6′ LF-14 Pangborn Table	$2000.00
4′ LG-14 Pangborn Table	2200.00
9′ LG-14 Pangborn Table	4500.00
6′ LG-14 Pangborn Table	2500.00
Pangborn 8 x 10 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4000.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
27 x 36 Wheelabrator Tum. w/loader	2250.00
4′ American Multi-Table	2500.00
15 x 20 Wheelabrator Tum.	1500.00
15″ Continuous Wheelabrator Tumblast	1000.00
8′ Wheelabrator Table Blast	2000.00
14 LG5 Pangborn Rotoblast Multi-Table w/5—5′ tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

CLEARANCE

$295.00 Each

SPO and Osborn Jolt Squeezers, Jolt Squeeze Strippers, Core Blowers, Rollovers.

FOR THE BEST DEAL CALL

BALCHER MACHINERY COMPANY
695 E. 152ND STREET
CLEVELAND 10, OHIO
TELEPHONE: GLenville 1-2474

For Sale

FOR SALE

CUPOLA

Never used—Never erected

90″ x 40′ (Morris) with blower, skip hoist, mixing ladle and electrical equipment.

THE LOUIS BERKMAN COMPANY
P.O. BOX 671
STEUBENVILLE, OHIO
PHONE: ATlantic 2-2704

FOR SALE

SHELL MOLDING EQUIPMENT

Shalco Core Blower MCM-6, will handle core boxes up to 18″ x 30″

Shalco Dump Box HOS-8. This machine has two stations, is automatic and accommodates pattern plates up to 24″ x 36″.

Both machines are like new and were originally purchased for research work.

HARRIS METALS TREATING COMPANY
4100 DOUGLAS AVENUE
RACINE, WISCONSIN

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS

Unused—Rebuilt

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

WHEELABRATOR FOR SALE

36″ x 42″ American Tumblast, complete with skip loader, dust collector, timer and exhauster. Excellent condition. Address: WELDON F. STUMP, 4835 CRESTRIDGE, TOLEDO 13, OHIO, PHONE: SYLVANIA, OHIO 22006.

For Sale

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24″ x 16″, 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models: 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R. UNION, NEW JERSEY

FOR SALE

SHELL-O-MATIC Molding Machine, fully automatic practically new.
No. 1 SIMPSON Muller
V-S CARVER Mixer
No. 550 BELLVIEW Tilt Furnace
No. 500 FISHER Holding Furnace
No. 100 FISHER Pull Type, with burners, blowers, crucibles.
No. 2 CLEVELAND Table Vibrator, like new.

SACRIFICE PRICES
ATOMETTE COMPANY, INC.
523 FAIRWAY DRIVE
WOODMERE, NEW YORK
FRanklin 4-6227

FOR SALE

One Besly Single Spindle Disc Grinder #205 with 3 H.P. Westinghouse Motor, ball bearing, 18″ disc, geared level feed table. Condition, like new. Only used 50 hours. Price—$800.00.

NEW STEEL SALES COMPANY
P.O. BOX 125
BINGHAMTON, NEW YORK

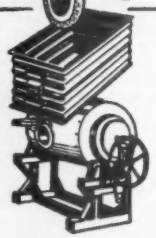
FOR SALE

National Screening and Magnetic Separator Unit with 3 HP motor, excellent condition, also Sinder Box Car Loader with 3 HP motor, good condition. Address: CLIMAX CORP., BATAVIA, NEW YORK.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.
14919 SARANAC ROAD — CLEVELAND 10, OHIO



DUST COLLECTOR
1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.

WHEELABRATORS
1—27″ x 36″, 5 cu. ft. Tumblast, w/loader
1—36″ x 42″, 11½ cu. ft. Tumblast, w/loader
1—42″ x 48″, 17½ cu. ft. Tumblast, w/loader
1—36″ x 42″ air blast Wheelabrator

CRANE
1—Overhead floor operated, 40 ft. span, 5 ton cap.

SAND SLINGERS
1—B-P Riddle type, 19″ head, 4″ tip
1—B-P Motive Jr., 19″ head, 4″ tip
1—B-P double belt, 19″ head, 4″ tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACES:
1—80 lbs. Detroit Rocking
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

ACME Does It Again!

Huge Foundry Liquidation!!

We have just purchased and are now liquidating The Oliver Corporation's Gray Iron and Malleable Foundries at 533 S. Chapin St., South Bend, Indiana, which has been declared surplus to their needs.

OVER $3,000,000 REPLACEMENT VALUE. OVER 250,000 square feet crammed full with LATE TYPE Foundry Equipment.

FOUNDRY

11—MULLERS. 5—B&P #80; 1—B&P #70; 1—B&P #50; 2—B&P #40's with skips; 2—Clearfield #930.

8—MOLDERS HOPPER LINES—150 Hoppers.

10—"NO LEAK" Steel Slat Conveyors.

3—MOLD CONVEYORS

20—Belt Conveyors, Trough and Flat Belt, some have magnetic pulleys.

8—Revivifiers and Sand Screens

8—Overhead Sand Bins 1000 to 4000 cu. ft.

11—Shakeouts: Robbins, Simplicity, Link Belt

5—Oscillating Pan Conveyors.

10—Bucket Elevators 41 to 60 feet.

B&P Slinger, Turntable, Plate Feeder.

150—MOLDING MACHINES, JOLT SQUEEZE PIN LIFTS: SPO 2222, 2160C, 2160, 2148, 2136, 214, 113J, and 110J; OSBORN 276J and 275J. ROLLOVERS; SPO 507, and 506; JOLT SQUEEZE ROLLOVER DRAW 413D, PIN PUSHOFFS B&P AL2428.

7000′ Roller Conveyor 12″ to 26″.

CLEANING ROOM

American Continuous Shot Blast, 3-48″ x 48″; 3-42″ x 36″; 4 Whiting geared motor drive tumbling barrels—12—HISEY WOLF Grinders, 30″ to 18″ wheel sizes.—Wood Slat casting sorting conveyors.

3—Whiting Hydroclone Dust Suppressors.

5—Rotoclones—3 Bay type Dust Collectors.

CORE ROOM

Core Blowers: 3—Demmler 2K, 2 Demmler #2; 4 Demmler #1; 1—Demmler #50; 2—International SB13; 9—Redford Bench type Rollovers —2 Spo 507; 2-Spo 506; 1—International R.E.D.P. 6—Hand Rollovers.

COREOVENS—Coleman Car type and Young Brothers continuous core ovens, core racks, core buggies.

HEAT TREATING

7—General Electric 5 Ton Electric Annealing ovens 1750° and 1350°.

MELTING DEPARTMENT

Cupola—4 Whiting #7; 2—Whiting #6.

WHITING HYDROARC ELECTRIC DUPLEXING FURNACE.

2—Whiting Air Furnaces, 2—30A Coal Pulverizers.

2—Whiting 7½ Ton OET cranes 108′ span.

Whiting Tiger Charge Crane—3 Whiting U holding ladles. Overhead scrap storage, charge and weigh hoppers, Canton Shear, 55″ Magnet.

3—Whiting Allis Chalmers Cupola blowers. Whiting Slag Disposal Units.—36 Modern Pouring devices, Scales 100# to 12,500#.

CRANES

2—Whiting 7½ Ton 108′ Span OET Cranes.

42 CLEVELAND Bridge Cranes, 800′ 10″ arch beam, 2000 feet "T" Rail.

15 CLEVELAND Hot Metal Carriers, 2600′-10″ Arch beam rail.

11—Electric Monorail Hoists 1—5000#.

3 **STRAIGHTENING PRESSES:** 500 TON H.P.M.; 50 TON and 25 TON OIL GEAR.

AIR COMPRESSOR—300 H. P. Synchronous Chicago Pneumatic.

WRITE • WIRE • PHONE

ACME EQUIPMENT CO., INC.

LIQUIDATION OFFICE: Phone Atlantic 9-9263

533 S. Chapin St. P. O. Box 486 • South Bend, Indiana

Chicago Office & Warehouses • 126 S. Clinton St., Chicago 6, Illinois • ANdover 3-3430

Circle 907 on Page 103

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR & ELECTRIC HOISTS

15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, ¾, ½, 1 ton.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS

12—LINK BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—TABOR B7½ AC, 14" wheel, 7½ HP.
3—TESSEMER H & L Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLOW. Model CB-40-B. 40# Cores.
1—SAN BLO Model 40P-1, w/pulsator.

CORE OVENS

1—CARL MAYER 2-Compartment, oil fired, I.D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.
1—YOUNG BROS. 6' x 6' x 9' double door, rack type, gas fired.

CUPOLA BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
1—ROOTS CONNERSVILLE Type RCS Size 20 x 60 w/75 HP motor.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—TOCCO 20 KW Induction Unit, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilting. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
29—LINDBERG FISHER & CAMPBELL, HAUSFELD Stationary, Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Iron.
1—STROMAN, Model "U," 600# Reverberatory Hand Tilt.

HEAT TREAT FURNACES

1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP. 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65. 30" x 3". 20 HP. 4 speed.
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder. 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles, 2 & 3 ton capacities. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—HERMAN 8' x 12' table, 32,000# cap.
1—J&J 50 x 72 Table—5000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30.
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Sizes 20" x 8", 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J & J #612, 24" x 30" Table.
4—J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35 x 50—2000#
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 X 10" draw, 36" x 36" table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2842, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102—42" x 50" Table.

Pin Lift

9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs., up to 30" x 40" flasks.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
MILWAUKEE No. 165, 24" x 30" table, 16" sq. cyl.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
4—INTERNATIONAL PKL, 17" x 28".
1—INTERNATIONAL PK-20, Size 20" x 8".
2—OSBORN 716 PJ-22" x 34" Table—16" dia. sq. cyl.

CONVEYORS

Steel Apron

9—JEFFREY & LINK BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 26' L x 4" deep pan
1—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12", 18" & 20" wide. 2⅞" dia. roller, 1⅛" hex shaft centers, 4" channel.
500—MATHEWS 12" & 36" wide, 3½" dia. 1" hex shaft on 6' centers, 6" channel.

Mold

3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

MOLDERS HOPPERS & STORAGE BINS

7—NATIONAL & LINK BELT Storage Bins. 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #40 Speed Muller, 6 cu. ft.
1—B & P #50, SpeedMullers, 9 cu ft.
1—B & P #60, Speed Muller, 12 cu. ft.
2—B & P #70, Speed Mullers, 18 cu. ft.
2—CLEARFIELD No. 610 w/skip hoist loaders. 10 to 14 cu. ft. batch.
CLEARFIELD #404, 4 cu. ft. cap, 5 HP.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH
1—SIMPSON No. 1H Style UD—500#
1—SIMPSON #1½, Style UD, 700 lb., w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
SIMPSON "PORTO-MULLER", 3 cu. ft. cap.
2—Mixer Muller, 6 cu. ft. paddle type.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" cutting blade—1952.
1—MOULDERS' FRIEND 60" Brush.

SANDSLINGERS

1—B & P Motive Jr., 300 cu. ft. tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.

SHAKEOUTS & SCREENS

2—LINK BELT 5' x 10', 6 ton cap.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#
2—ROBBINS 3' x 5' JF6—2000#
1—ROBBINS 4' x 6' JF9—8000#
1—ROBBINS 4' x 8' JF9—10,000#
1—ROBBINS 6' x 10' JF11—20,000#
1—ROBBINS 8' x 10' JF11—30,000#
1—SIMPLICITY 4' x 6' Model B.

SAND BLAST EQUIPMENT

1—AMERICAN 36" x 42", w/skip Hoist.
2—AMERICAN 48" x 42", w/skip Hoist.
1—AMERICAN 27" x 36" w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7-14" tables.
1—AMERICAN No. 2A multi-tablast.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN No. 53 type EN-2 blast cabinet with dust collector.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN #44NF Shot Blast Room 10' x 9' x 9'.

TUMBLING BARRELS

13—SLY & WHITING. All late type units, with gearhead motors and built in magnetic brake, Timken bearings. Following sizes: 30" x 48", 24" x 48", 30" x 60", 36" x 84", 42" x 72", 48" x 72", 48" x 96", 72" x 120".

AAA MACHINERY & EQUIPMENT CO.

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UNIVERSAL REBUILT EQUIPMENT GUARANTEED

AIR COMPRESSORS
COMPLETE STOCK—BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—20" x 27" AMERICAN WHEELABRATOR, Rubber Belt
1—27" x 36" AMERICAN WHEELABRATOR TUMBLAST, Rubber Belt
1—36" x 42" AMERICAN WHEELABRATOR TUMBLAST
1—48" x 42" AMERICAN WHEELABRATOR TUMBLAST, w/loader
1—36" Continuous AMERICAN WHEELABRATOR, side discharge, two heads, Serial #A95643. New 1953. Used 2 months
1—#1-A Multitable AMERICAN WHEELABRATOR, 6-26" tables, New in 1954, w/dust col.
1—PANGBORN TABLAST, 8' Table
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round, complete

CONVEYORS
1—JEFFREY, 3 compartment, ingot mold
1—LINK BELT, vibrating, 80' x 24", w/exhaust hood
1—LINK BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK BELT, 30" Steel Apron Conveyors, 100' Centers
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES
200 ft. WESTOVER Track w/100 Aluminum Pallets 31" x 19"

CORE BLOWERS
1—CHAMPION CB-10
10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A", Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap., New

DUST COLLECTORS
1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING
1—250 Lb. LECTROMELT, Side Charge
1—500# LECTROMELT
1—3000 #/hr LECTROMELT
1—3000# HEROULT
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING
1—3 KW, AJAX, Lab type
1—20KW, AJAX SPARK GAP, High Freq.
1—100 KW Water Cooled, 300# Steel—NEVER USED
1—333 KW AJAX 1000#

FRACTION OF COST
3 Ton Top Charge
SWINDELL ARC FURNACE
Unit is in Excellent Condition, Dismantled, ready for Immediate Delivery.
IMMEDIATE DELIVERY

FURNACES—GAS & OIL
1—FISHER MNP, Gas Tilting, 1700#
1—400# FISHER MNP, Gas Fired
1—400# FISHER, Oil, Stationary
1—250# FISHER, Oil, Tilting
3—Stationary, Gas, 250# to 1000#
1—HAUSFELD, Tilting, 1200# capacity
1—STROMAN, Gas, 1000# cap. Alum., auto control hyd. tilt.
1—STROMAN, Gas, 600 lb., "U" Type

FURNACES—HEAT TREAT
1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—20" x 24" deep, L&N Homocarb electric
1—20" x 36" L&N Draw electric

MOLDING MACHINES
Jolt Rollover Pattern Draw
2—J & J #1020, 50" x 60" Table, 3000#
1—J & J #918, 44 x 54 Table, 20" draw
2—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 50" x 72"
1—HERMAN 3000#, 30" x 66" Table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
2—INTERNATIONAL, 13" x 17" table, 6" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 50", 18" draw
1—OSBORN #42, 15" x 20", hand draw
3—Tabor 40" x 60", 1500 & 3000# capacity
1—TABOR, 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20" x 30" w/air clamps, 1000#
2—TABOR, 14" x 16" Rockover

Plain Jolt
5—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
3—SPO #305, #307, 750 lb., 1500 lb.
1—TABOR, 17" x 20" table, portable
1—TABOR, 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL, PKL, 18" x 24" table, 12" sq.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#
2—MILWAUKEE #163, 15" x 24" table, 11" sq.
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq.
1—OSBORN #716PJ, 22" x 34" table, 1250#
4—SPO #2114P, 21" x 27" table, 600#
2—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers
4—INTERNATIONAL #10 LJS, 17" x 20"
1—MILWAUKEE #104-5JS, 17" x 21", port.
1—NICHOLS #12 F-P, portable, 600#
27—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#
3—OSBORN #276J, 17" x 26" table, 13" squeeze
10—SPO #110J, 17" x 20" table, port.
8—TABOR, 3" jolt, 17" x 20"

MATERIAL HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—CLARK, Fork Lift, Gas, 3,000 lb., capacity, Solid Tire
1—HOUGH PAYLOADER, Model HA, 1000# cap.

MULLERS AND MIXERS
1—B & P #30 Speedmullor, 3 cu. ft. batch
1—B & P #70 Speedmullor, 15 cu. ft. batch with cooling and skip loader.
1—B & P, Conventional, SIMPSON type, 87¼" Dia., arranged for cooling
1—CLEARFIELD #404, 4' Dia., 4 cu. ft. batch
1—CLEARFIELD #610, 6' Dia., 10 to 14 cu. ft. batch, w/loader
1—MULLER Plaster & Mortar Mixer, 3 cu. ft. batch, Pneumatic Tires
2—SIMPSON #0, U.D. 3' Dia., never used
1—SIMPSON #2, 6' U.D. Dia., 14 cu. ft. batch
1—SIMPSON #3, 8' Dia. Unit Drive, with loader 20-25 cu. ft. batch

LADLES AND POURING DEVICES
Bottom Pour
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 50" top
Lip Pour
1—WHITING 42" x 42" top dia., geared
Cylindrical
8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING 19" L x 25" dia., 600# iron
3—WHITING, 38" L x 28" dia., 2200# iron
Pouring Devices
7—WHITING, 850# to 2000# gross cap.

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, OD. 22" x 12' x 10'
2—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—KOCHS BROS. Electric, 36 x 40" x 64" inside
2—ROSS, Gas, 2 compartment, recirc., rack type, 6¼' x 14' x 7'
1—THERMONIC Dielectric Core Oven, Model M900-A

SAND CONDITIONING
3—B & P Screenarator, Model "S" & "M"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—NATIONAL ENGINEERING SAND-PREPARATOR Unit w/permanent magnet pulley
2—ROYER, NC-2, 10-15 tons/hr., 1½ HP Motor
1—ROYER PREPARATOR, Comb. Model NDC, 25 Ton/hr. Scrap removal, 8' x 8' hopper
1—ROYER, NDP 15-25 ton/hr., 2 HP
1—ROYER, NRS, 40-60 tons/hr., 5 HP

SAND CUTTERS
1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP, 48" Reel
1—MOULDERS' FRIEND, 61" brush, reversing control, Like New

SAND SLINGERS
1—B&P Stationary, 2 Speed, 19" head, 4" tip
1—B&P Stationary, Single Speed, plate feeder
1—B&P Tractor Type, 19" head
1—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS
1—HEWITT ROBINS, Vibrex screen, 3' x 8'
1—ROBINS 48" x 72", Like New
1—ROBINS Vibrating Screen, 36" x 78"
3—SIMPLICITY, 3 x 8, 5 x 8, 8 x 10

MISCELLANEOUS
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
1—PATTERSON-KELLEY Twin Shell Dry Blender, 3 cu. ft. capacity
FLASKS, CORE PLATES, All Sizes
500,000# Hyd. Compression Testing Machine
4" FOOTBURT Horiz. Bar Mill
5 Ton WELLMAN Charging Machine
1—TABOR Cut-Off Saw, 7½ Hp motor
1—CLIMAX Model 2-A Wire Straightener
10 or 15 Hp GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S. Cinn. Gardner, 5, 7½ & 10 Hp

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THE ACME BARGAIN PAGE

AIR COMPRESSORS
2—INGERSOLL RAND 450 cfm., 100 hp., 220/440 V.

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm, 24 oz., 58 hp. motor
INGERSOLL-RAND 10,000 cfm, 32 oz. 150 hp. 220 V.
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36" x 162' LINK BELT Oscillating Pan 10 hp., 220-440 V.
36" x 53' LINK BELT Oscillating pan.
17' BARBER GREEN Bucket Conveyor.
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18" x 10' Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16" x 120' Rubber Belt w/drives.

CORE BLOWERS
REDFORD #2 up to 5# cores
REDFORD Bench types, horizontal or vertical clamping
2—CB15 up to 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½" draw.
DEMMLER #4 up to 250# cores.
DEMMLER #3 up to 35# cores.
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
7—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-393 42" table

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28' Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 Ton AMERICAN Railmaster Low headroom floor control
10 Ton SHAW BOX electric hoist

CUPOLA GUNS
2—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTOR
PARSONS 40,000 cfm. cloth bag type

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place
1—"LECTROMELT" 2 TON Size Q 4000# per hour 1500 KVA 13200 Volt
1—"LECTROMELT" Size S 1000# per hour, 500 KVA 7200 volt
LECTROMELT 500#, Size T, 300-375 KVA 2300 V primary, Moore controls, G.E. circuit breaker.

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V
2—DETROIT "LFC" 350# Tapered shell 7200V

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty, pot type
1—HEVI-DUTY HD-181-S Pot type Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 gas fired crucible
3—CAMPBELL HAUSFELD gas fired 625# brass hand tilt

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
2—HAMMOND 20" DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20" DE Porter Cable backstands 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
U.S. 20" x 2½" x 6" 10 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ h.p.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20" disc and 20" x 3" x 1¼" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42" x 40" Electric

HOISTS
72" x 48" LINDBERG Electric 80 K.W., 1250 degrees
SHAW BOX 5 TON floor control Hand travel
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
1—6000# Industrial Enclosed Geared Crane
1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE TABLE, 24" x 30".
2—#125-3 MILWAUKEE TABLE, 21" x 27"—12" cyl.
7—OSBORN 712 PJ, 18" x 21" Table
1—CHAMPION JSL10P 18" x 21" table 6" draw.
2—#2114 G. SPO TABLE, 26" x 27"—11" cyl.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table.
1—SPO, 110J Portable 17" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60" x 50" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
2—750# HERMAN 20" x 30" table
20 x 8" INTERNATIONAL type G, 20" x 30" table
2—INTERNATIONAL RJ 20 x 12"
DAVENPORT 28A, 1500#, 29" x 40" Table

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 26" x 27" table, 8" draw

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
1—#2 SIMPSON Unit Drive
2—#1 SIMPSON Mullers

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
2—B&P Tractor 19" heads
B&P 2 speed 40/25 HP double belt
B&P Plate Feeder, 5 ton

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3' x 8' SIMPLICITY

SHAKEOUTS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
5' x 10' LINK BELT

SHOT BLAST
SLY #4, 20" x 20" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, °continuous type
COLEMAN 55 Spectrophotometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
2—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loader
1—27" x 36" AMERICAN Skip Loader
3—44-48 Hollingsworth

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc.
OLIVER 72DR Router or borer
BOICE CRANE 12" Planer
NORTHFIELD #4 Tilting Arbor Saw
STATE Oscillating Spindle Sander
TANNEWITZ Type U Tilt Arbor Saw
TANNEWITZ 30 & 42" Band Saws

EKSTROM CARLSON #540 Universal Router Mill Drill

WIRE STRAIGHTENERS
AMERICAN type H rod ⅜"-⅝" cap.
2—#2A CLIMAX ¼"

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FOUNDRY

Penton Building, Cleveland 13, Ohio
Main 1-8260

BUSINESS STAFF

GEORGE A. POPE
Business Manager

MARY JANE KIMPEL, Advertising Service Mgr.

DAVID D. GIBBS, Market Research Mgr.

S. F. MARINO, Promotion Dir.

J. M. CASTIGLIONE, Production Mgr.

BETTIE COOK, Circulation Mgr.

DOLORES BUTRICK, Classified Advertising Mgr.

MILDRED CHRISTOPHER, Census Mgr.

JEANNE CORSIGLIA, Staff Asst.

JUNE SCHILENS, Reprint Service

Branch Offices

New York, 17 .....60 East 42nd St.
J. F. AHRENS, J. L. OZANNE
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Chicago, 11 .....520 N. Michigan Ave.
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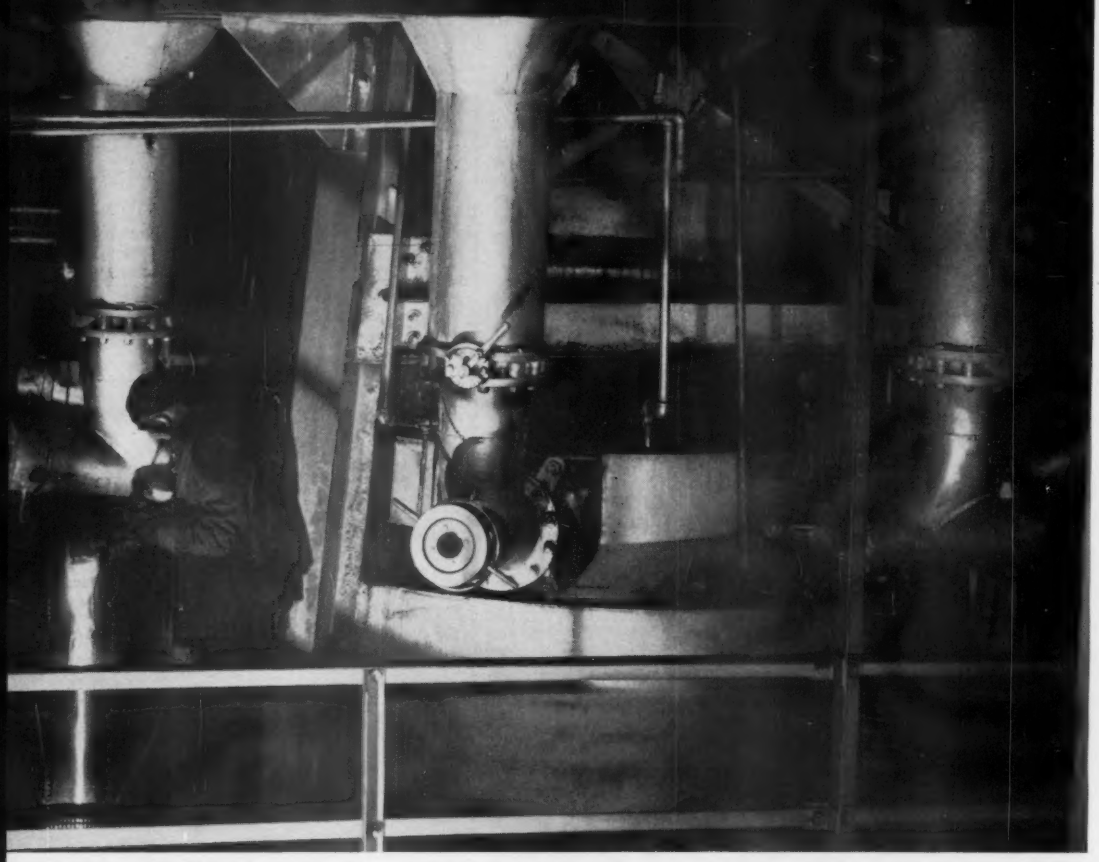

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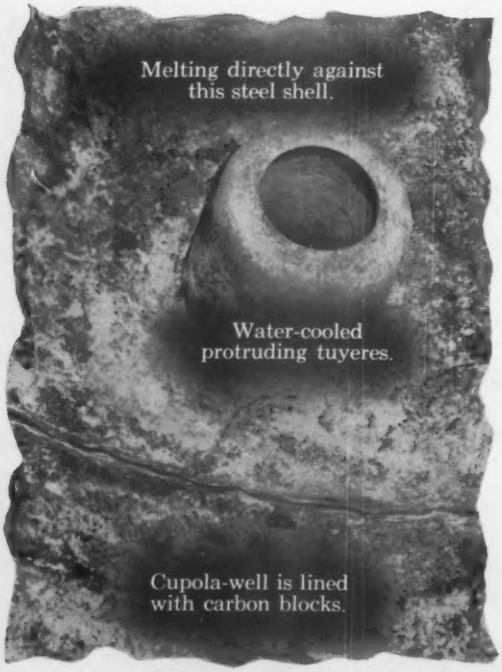

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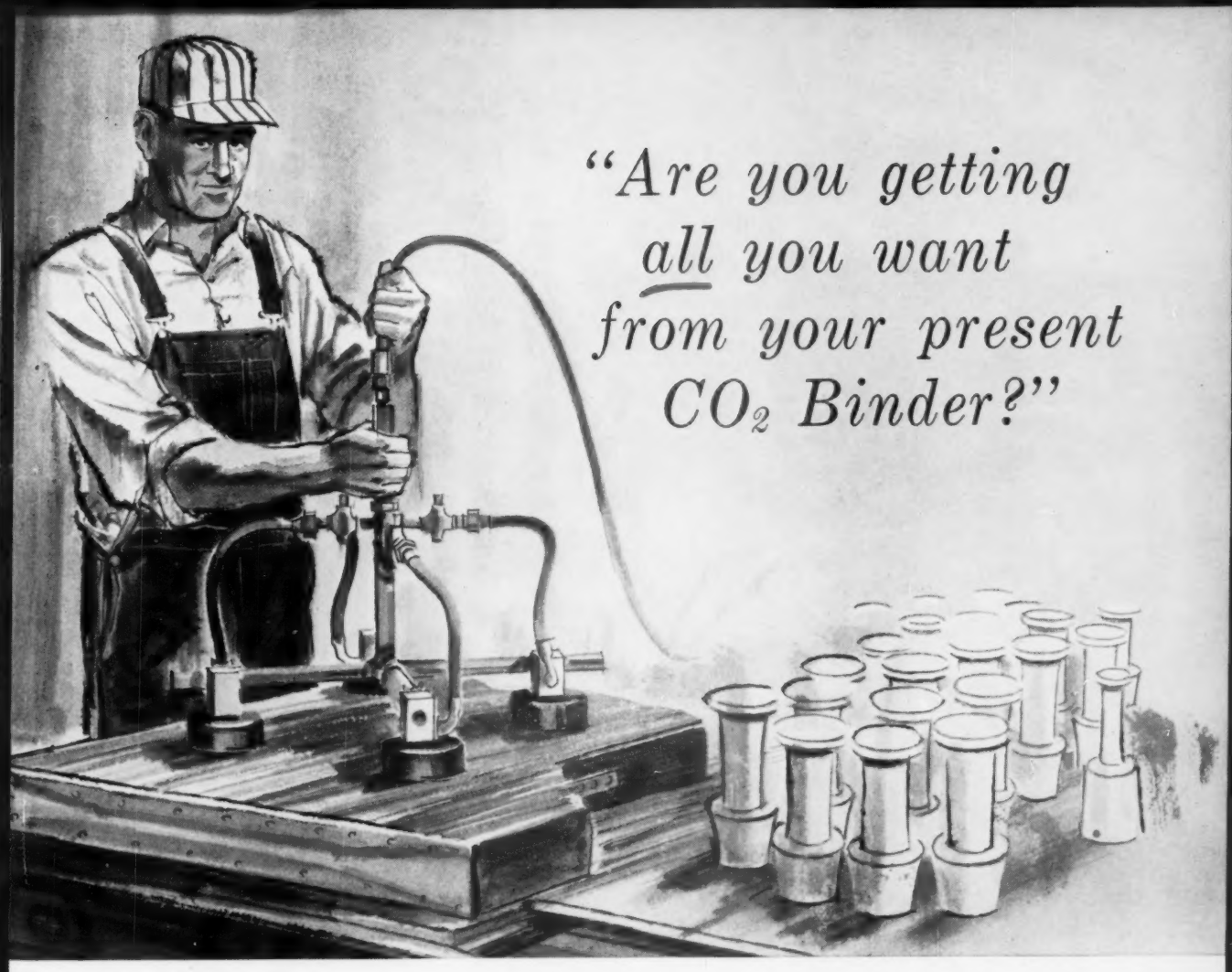

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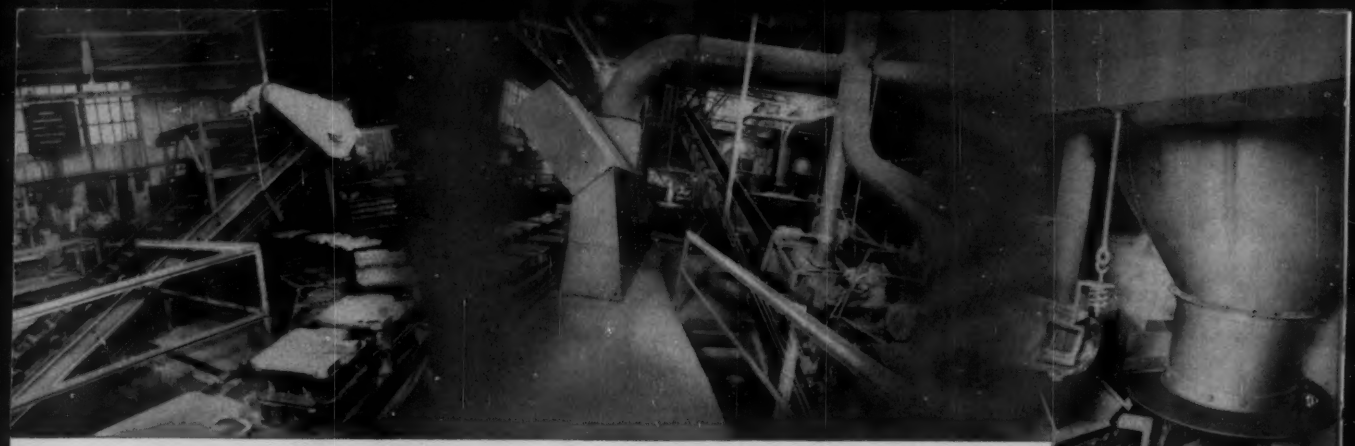

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